MODERN PLASTICS

NOVEMBER 1947

★ *New Pages from the* **DUREZ** *Diary*

● Something new is the Johnson Indoor Target Gun, with very high standards of safety, accuracy, and realism.

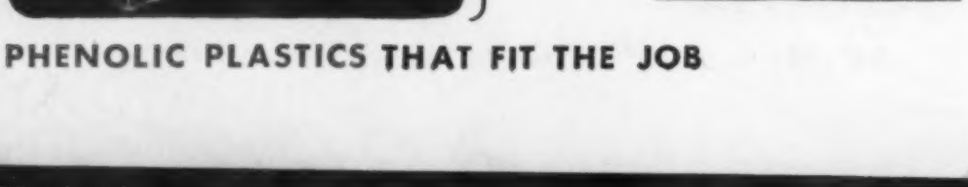
To set these standards, "toy" ideas of the past were discarded. Intricate shape, weight, cost, and precision demanded a fresh approach toward materials. With the manufacturer, the molder (Plastics Manufacturers, Inc.), and Durez technicians cooperating, extensive use of a phenolic molding compound was decided upon.

The stock, hand grips and lower portion of the barrel are molded in one piece. The butt plate is produced in the same mold. The third plastics part is a small and intricate transfer molded pellet carrier.

Wide use of Durez makes the gun light enough for a small boy to handle easily. The ease of molding Durez eliminated the need of expensive, and wasteful shaping of the hand grips, and also assured the accuracy that helps an amateur to hit small targets at 30 feet. Impact strength, rich color, and smooth "feel" are added sales-building features inherent in Durez phenolics . . . the most versatile of all plastics.

If you are aiming at new markets, or taking new aim at your present ones . . . consider the many possibilities of Durez. Our 26 years of specialized experience with the phenolics is at your molder's call—and yours.

Durez Plastics & Chemicals, Inc. 511 Walck Road, North Tonawanda, N. Y.
Export Agents: Omni Products Corporation, 460 Fourth Avenue, New York 16, N. Y.



PHENOLIC PLASTICS THAT FIT THE JOB

"COME AND GET IT...WE'RE SERVING A *Loalin* COLOR-PLATE SPECIAL!"

Multiply this one appetizing example of a Loalin "Snack-Master"* service by the number of good fellows present . . . Picture the pleasure—lightweight, partitioned trays with palette-like thumb openings, so designed that the guests can hold, balance and gracefully indulge in generous helpings! These trays are informal, lend a friendly atmosphere of color to the occasion, are ever so practical in that they wash off quickly, nest away flat . . . insure the picnic-party's success.

Loalin, a polystyrene molding compound, and an important member of the Catalin plastics family, brings many advantages to both molder and application. As a production economy, Loalin, by virtue of lightest weight, yields, per pound, the greatest number of finished pieces. Loalin possesses excellent dimensional stability; the ideal medium for precision processing to closely held tolerances. Physically, Loalin is strong, has desirable electrical properties, sparkling color, brilliance, and an appealing touch. When, to these, you include a favorable per pound cost, the reason for Loalin's tremendous demand becomes apparent

When considering a material for your next new product application, remember these two fine names in plastics – Loalin polystyrene molding powders and Catalin cast phenolic resins. The selection of the right material, combined with advance discussions as to proper processing methods and mold or arbor design, can gain much from a beforehand meeting of minds! Inquiries are invited!

CATALIN CORPORATION OF AMERICA
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**Designed, engineered and molded by American Injection Molders, Inc., Long Island City, N. Y.*

CATALIN
THE GEM OF PLASTICS
Catalin

CAST RESINS • LIQUID RESINS • MOLDING COMPOUNDS

MODERN PLASTICS

VOLUME 25 NOVEMBER 1947 NUMBER 3

CONTENTS

"EXECUTIVE and EDITORIAL OFFICE: 122 E. 42nd St., New York 17, N. Y. Published the 5th of each month by Modern Plastics, Inc., at Publication Office: Twentieth and Northampton Sts., Easton, Pa. Entered as second class matter, May 28, 1940, at the Post Office at Easton, Pa., under the act of March 3, 1879." Subscription $5.00 a year, $8.00 for two years in U. S., its possessions and South America. Canadian subscriptions $5.50 per year. All other countries $6.00 per year, payable in New York funds.

Floors to Last a Lifetime

Another interesting application of GEON polyvinyl materials

THE maker of that floor in the picture won't say so—he says people wouldn't believe him. But chances are the floor will last a long lifetime. It's a new kind of tile—a plastic made from one of the GEON polyvinyl resins.

It's another case of selecting the *right* material for a given job. In this busy airlines ticket office the floor takes a terrific beating from morning till night. It has to resist wear, aging, sunlight, dirt, water, and many other normally destructive elements. It must clean easily, and stay fresh looking and attractive.

GEON resins can be compounded to provide these and many other properties in an amazing number of combinations to meet specific service conditions.

And they may be processed in many different ways—extruded, calendered or cast into sheet or film, pressure or injection molded. In latex or solution forms, GEON may be used to coat and impregnate fabrics, paper, and cardboard. Products made from GEON resins may be flexible or rigid—clear or opaque—brilliantly or delicately colored.

While we make no finished products from GEON or any other raw materials manufactured by B. F. Goodrich Chemical Company, we'll be glad to work with you on any special problems or applications. For more information, write Dept. O-11 B. F. Goodrich Chemical Company, 324 Rose Building, Cleveland 15, Ohio.

Photo courtesy United Air Lines
Floor tile manufactured by the Sloane-Blabon Corp.

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Price cutting must be shunned

Price cutting is showing signs of rearing its ugly head in the plastics industry. Evidence has trickled in which indicates that nearly all sectors of the industry, including materials, equipment and finished products, have been exposed to this practice. Fortunately, the situation does not seem to have reached a serious stage, but those few individuals who have been hit are just as seriously hurt as though the movement had attained major proportions.

Price cutting is as old as merchandising. In some cases, it's a good, healthy sign of competitive enterprise. And we are scarcely naive enough to believe that the unhealthy aspects of price cutting will be stopped because some critic says, "Naughty, naughty!" We realize that everyone who reads these paragraphs will point his finger and say, "Not me—it's that other guy!"

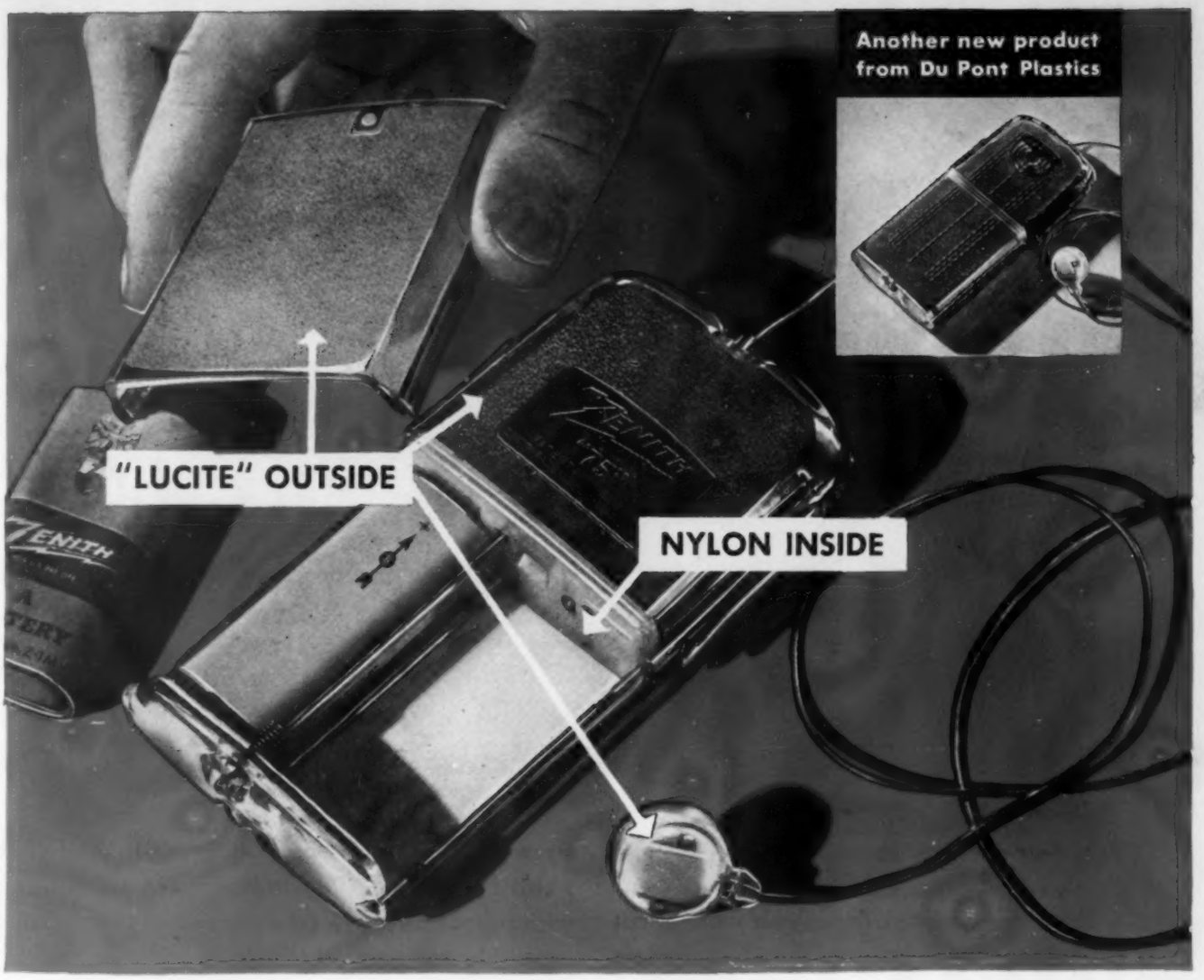
Nevertheless, caution must be urged. Price wars are costly operations to the perpetrator as well as to the victim. If a cut-throat situation developed in the plastic industry, it could be cataclysmic. Large segments of the industry are still new; they could ill afford a disruptive price structure that could only result in degraded merchandise and inferior service. There are many more important things confronting a young industry that has just come through a trying period of adjustment than for its members to haggle among themselves over a situation that will eventually correct itself.

How can price cutting, with its attendant degrading results, do anything but harm to an industry whose chief problem is to have the public accept plastics as basic materials—materials that are equal, and sometimes even superior, to older but better known products? How can an industry afford price cutting when attention should be focused on public relations—better advertising—simplified nomenclature—informative labeling—standardized testing?

Today's object should be to produce in volume at stable prices. Lowering prices to meet consumer acceptance is good and necessary, but costly price cutting merely to beat competition is only a means of last resort and a sign of inability to keep up with progress. It betokens a lost cause.

In an industry such as plastics where new and brilliant products and ideas are born every day, there are other ways of meeting competition than by the last-ditch price-cutting route. They include better understanding of customer requirements; better methods of distribution; better sales organization; better service; better products; better advertising.

There is only one way to reduce costs—and hence prices. We must make better use of buildings and factories; better use of equipment; better use of labor; better use of materials; and better use of the industry's trade organizations.



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WHAT'S NEW

Now cakes and pastries can be safely displayed on restaurant and cafeteria counters . . . under sanitary, transparent covers of Du Pont "Lucite." The covers are seamless, easily cleaned, non-toxic. And they're light, shatter-resistant . . . will not yellow with age. Made by Plastic Pioneers, Jamaica, New York.

Good news to thousands is Zenith's new low-cost hearing aid. It's tops in quality and performance . . . moderate in price. And it's made with Du Pont nylon and "Lucite" acrylic resin.

The case of "Lucite" assures dependable protection—lasting beauty—resistance to battery salts. Nylon is used as the inner supporting piece because of its strength, resistance to corrosive salts, and ability to withstand high temperatures during manufacture.

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There may be a place for a Du Pont plastic in *your* business . . . in developing a new product or improving an old one. Write for literature. E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Room 3611, Arlington, N. J.

Zenith "75" hearing aid manufactured by Zenith Radio Corporation, Chicago, Illinois.

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• SPECIFICATIONS •

Ounces molded per shot	4
Maximum pressure on material	16,000 P. S. I.
Size of die plates	16" x 21"
Clearance between bars	12"
Maximum die space	12"
*Area cast at 16,000 P. S. I.	35 sq. in.
Maximum shots per hour	350
Die locking pressure	100 tons
Floor space — length, width, height	148" x 50" x 75"

**Dependent on product and mold construction.*

For complete information about this new machine or its companion models of 8, 10, 12, 16 or 22 Oz. capacities . . . write Dept. D.

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Celanese plastics have been meeting manufacturer's specifications for years. Your Celanese representative is equipped with the plastics information you need. Get in touch with him . . . His facts are up-to-date, impartial, dependable.

Celanese Plastics Corporation, Dept. DI, division of Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y.

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LUMARITH* FORTICEL* CELLULOID* VIMLITE* CELCON*

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THE PROBLEM:

To produce clear automobile haze light lenses of polystyrene with total projected mold area of 272 sq. in. No surface or flow marks, no buffing permitted.

THE SOLUTION

It was a tough job—tough even for the highly skilled engineers and operators of Atlantic Plastics. They needed automobile haze lights—they needed them in perfect shape as they came from the molds—and they needed them fast! So Atlantic Plastics engineers, naturally enough, called on H-P-M. And H-P-M's 16-oz. injection molding machine solved the problem!

Let H-P-M's plastics injection machines help *you* over the rough road to lower-cost, higher-precision production. The H-P-M All-Hydraulic mold clamp allows for positive mold alignment and smooth clamp action . . . hydraulic pressure "backs up" the clamp platen at all times, provides positive mold sealing. Die set-up time is minimized. There are no complex mechanisms in H-P-M injection machines . . . there are no screws, toggles or links to adjust. Use of H-P-M machines in *your* plant will result in savings in time and material for *you.*

Get *your* copy of Bulletin 4405 today! It tells how a 16-oz. H-P-M machine can help solve *your* plastics problems.

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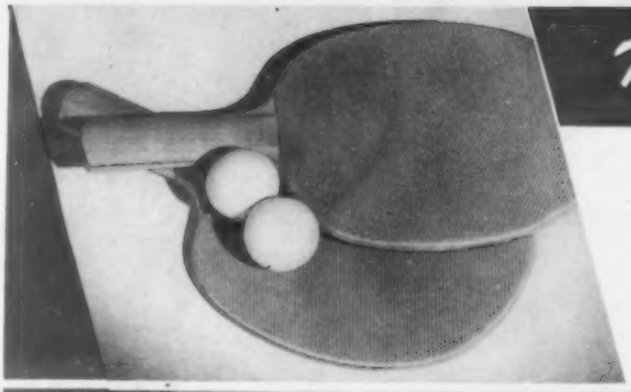


Nixon C/N

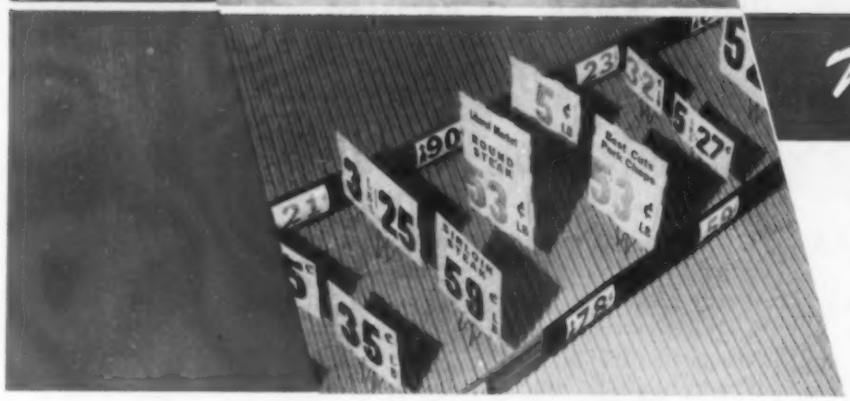
Table tennis

Table tennis balls, made from tough, resilient Nixon C/N (Cellulose Nitrate), can take a lot of paddling.

Nixon C/N

Toilet seats

When covered with simulated pearl Nixon C/N sheeting, toilet seats and covers are attractive, durable, and sanitary.



Nixon C/N

Tags

Tags and interchangeable die cut numbers made from sheets of Nixon C/N (Cellulose Nitrate) are easy to keep clean. The bright colors of the die cut numbers are an integral part of the material.

Cellulose Nitrate is not a new material. The first formulas were developed back in 1846. Nixon C/N (Cellulose Nitrate) has been used for many years. It is a very practical plastic to use. It works easily and has good machining qualities. It is available in a wide range of colors, including variegated color effects. Although it is a tough material, it can be easily printed and stamped, molded, punched, blown, extruded, drilled, tapped, turned, cemented, polished, and shrunk in place. It is dimensionally stable. It resists the corrosive effects of ink and many other liquids. It is water-resistant. It is tasteless. It is insoluble in animal oils, vegetable oils, mineral oils, and aromatic hydrocarbons. It is a good plastic to use for many purposes.

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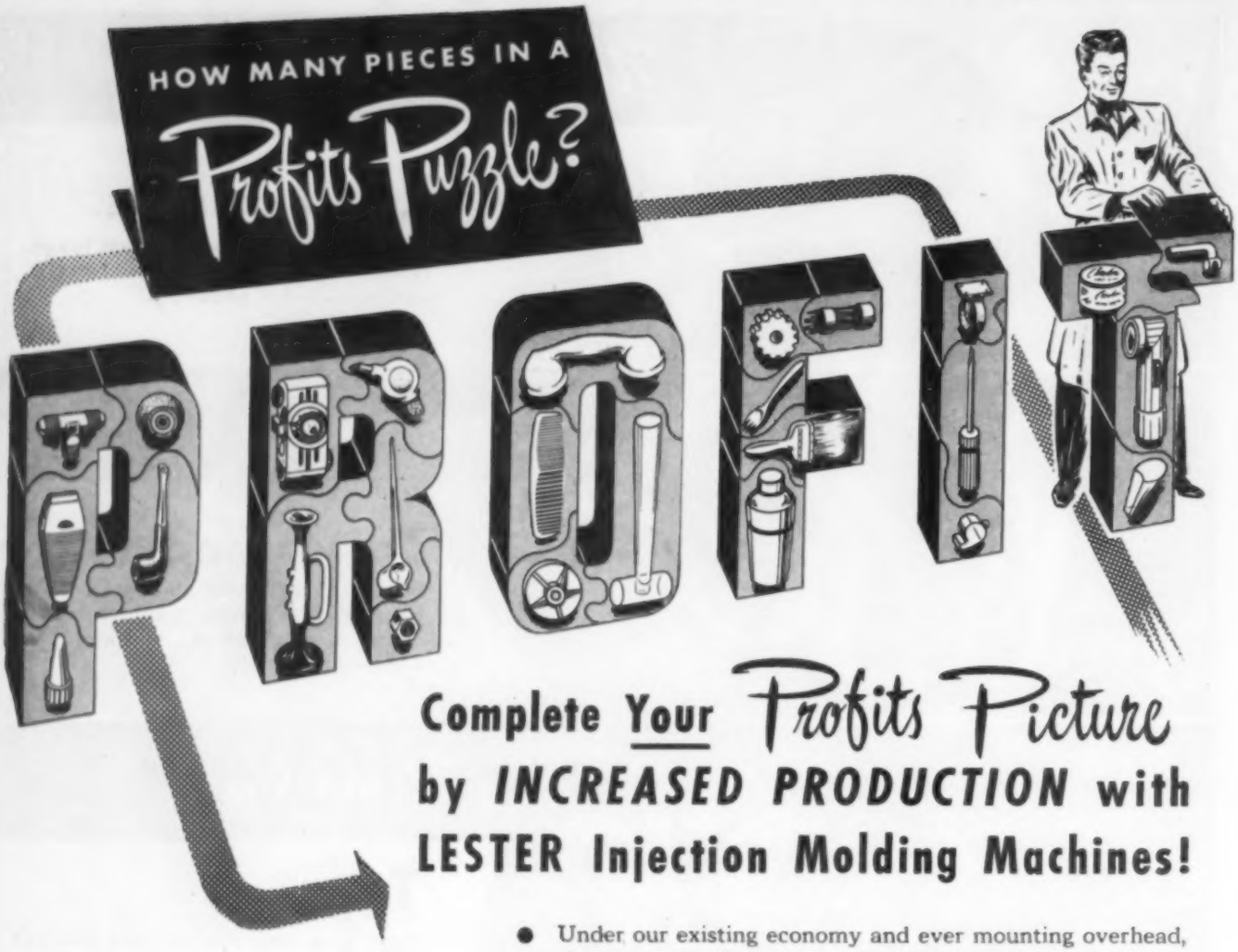
HOW MANY PIECES IN A

Profits Puzzle?



Complete Your Profits Picture by *INCREASED PRODUCTION* with LESTER Injection Molding Machines!

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The illustration above shows how little drops of Varcum resin are mixed with molten slag and compressed air to make one of America's best known insulating materials.

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Waterbury PLASTICS and the GAROD Radio

That's where you'll find things when you turn the job over to *Waterbury*. This attractive radio cover with its built-in loop antenna is a typical example of *Waterbury* mold craftsmanship — reflecting that *start-to-finish* skill acquired only through many years of experience. This is what *Waterbury* offers you in your product development work — whether it's a small plastic part or a complex piece with metal inserts.

At *Waterbury* you'll find molding facilities that are indeed complete — plus the engineering know-how that follows through from blueprint to finished product. You'll find single, direct supervision going hand in hand with lower production costs.

Whether your product calls for thermosetting or thermoplastic materials — compression, transfer, high-speed, or injection molding — *Waterbury* will get into production quickly — and fill your plastic needs completely.

Our technical staff will gladly consult with you. Write for *Waterbury* "Plastics" catalog.

WATERBURY COMPANIES, INC.
787 SO. MAIN ST., WATERBURY, CONN.

Let's look through this barrel!

THE TORPEDO SCREW

This design of screw, an exclusive and patented development of NRM, is recognized as a "must" for the proper extrusion of Cellulose Acetate, Cellulose Acetate Butyrate, Ethyl Cellulose, and Polystyrene. The extra milling action provided by the Torpedo and its ability to transfer heat quickly are all important in the successful handling of these materials.

UNIVERSAL TYPE SCREW

This type of screw was designed by NRM to enable custom extruders, who primarily run strip-fed materials, to switch to granular compound without changing screws. With the Universal screw, strip material feeds itself into the cylinder without interruption, alternately handles granules without permitting them to pack and choke in the feed hopper.

Here's the heart of your extruder.

Screw design, more than any other mechanical factor, controls the uniformity of production and the quality of your extrusions.

That's why NRM engineers have continued intensive development work and pioneered many new innovations in screw design and finishing methods.

NRM engineers are available to help you obtain better extrusion production. Write us an outline about your problems and we will work with you to obtain the results you desire.

NRM

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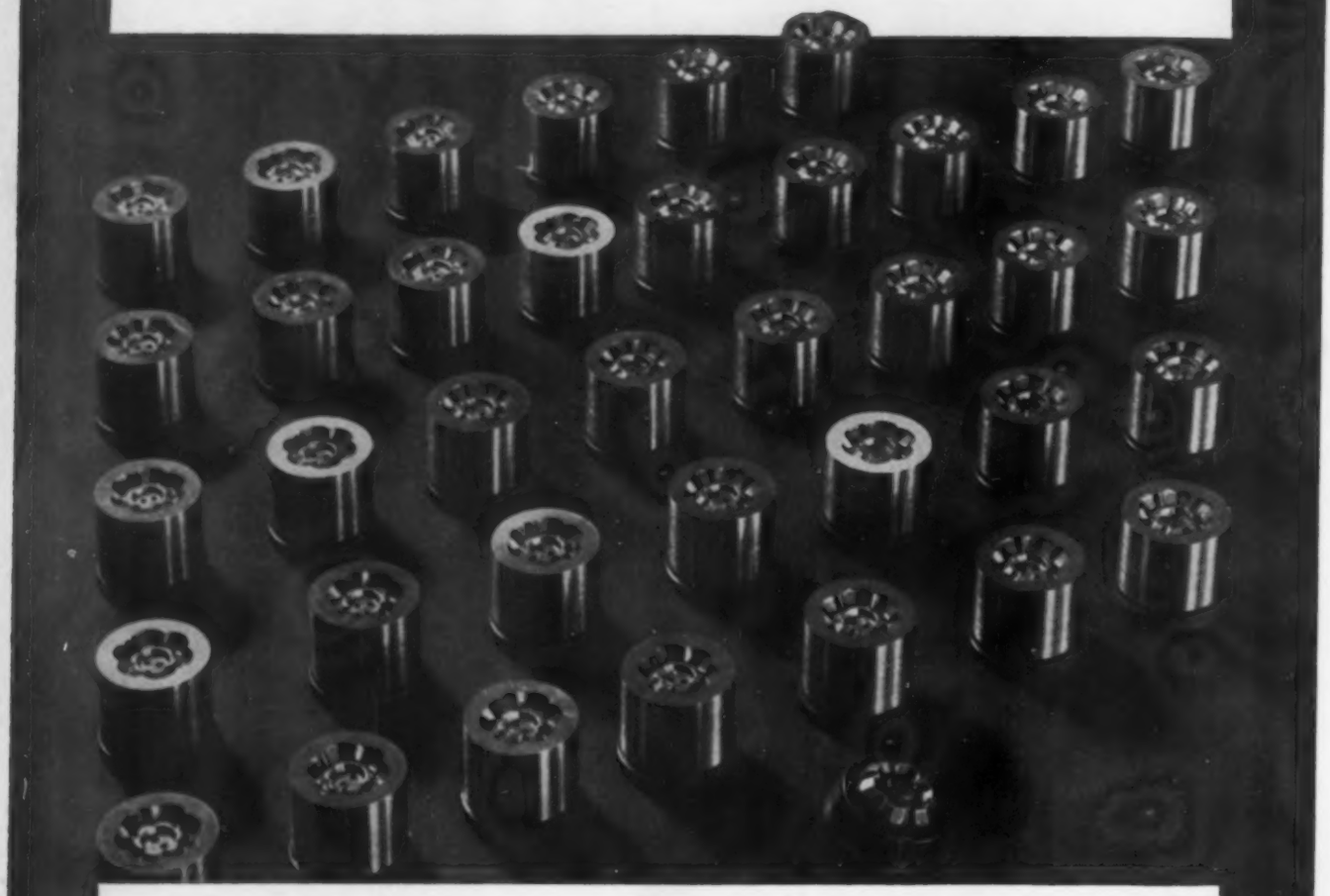
use DISSTON MOLD STEELS



for

- PRODUCTS OF ALL SHAPES AND SIZES
- SMOOTH, CLEAN CAVITIES
- EASY HOBBING AND MACHINING
- MAXIMUM ECONOMY

Whatever the nature of your plastic product or the molding process used, you will find that one or more of the three fine-grained Disston Mold Steels will meet your needs exactly.

Each Disston Mold Steel is made of carefully selected materials, in electric furnaces, by modern steel practice with every process under rigid control. Each is uniformly sound, carburizes evenly and produces smooth, clean cavities.

DISSTON PLASTIRON is a low carbon iron that withstands extreme hobbing. Recommended for difficult shapes and short runs.

DISSTON PLASTALLOY is a low carbon steel with the right amount of nickel and chrome to assure great core strength and wear resistance, yet permit easy hobbing. Recommended for medium runs.

DISSTON PLASTIKUT is a "cut mold" steel with alloy content for maximum core and case strength. Because of its great strength, Plastikut requires machining. But its ability to stand up under long runs makes its use economical.

WRITE FOR FOLDER—tells what to look for and what to avoid in selecting mold and hob steels. Contains analyses of Disston Mold and Hob Steels and other data.

●

DISSTON METALLURGISTS AND ENGINEERS WILL BE GLAD TO HELP YOU GET THE MOST FROM YOUR MOLD AND HOB STEELS.

ESTABLISHED 1840

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STEEL—Everybody who wants to obtain steel can help himself to get it by immediately starting scrap into the channels that serve steel mills.

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CAN TAKE THE WHOLE WORKS

Micarta can be fabricated in *mass production quantities*—to close tolerances usually associated with metals—and faithfully retain its machined dimensions.

This tough, workable material has a combination of qualities which makes it superior to metals or wood—in many applications.

In addition to its workability, Micarta—

RESISTS HEAT AND COLD—unaffected by temperature variations from 230° F to 112° *below* zero.

RESISTS MOISTURE AND CORROSION—withstands water submersion or mild acid solutions.

IS STRONG—the strength of aluminum at half the weight.

TAKES PAINT FINISH—can be painted for product eye appeal.

CAN BE MOLDED—several grades are suitable for post-forming into products such as radio cabinets, refrigerator inner door panels, luggage, etc.

Westinghouse is equipped to supply Micarta, molded, formed or *completely fabricated*. Investigate Micarta for application to your product. Call your Westinghouse office for a Micarta Specialist. Or write Dept. MP-11, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-06398

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Get this perfect package for molding powders

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EASY TO FILL, EASY TO EMPTY!

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LIGHT WEIGHT BUT RUGGED FOR ALL TYPES OF SHIPMENTS!

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RAW MATERIALS are coming through in healthy quantities—permitting Continental's expanded production facilities to push out more and more Leverpak fibre drums. Plan now to use this efficient, easy-to-handle, durable container that has served the plastics industry so well for so many years. Get in touch with The Container Company today.

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She'll Remember

A PLASTICS PACKAGE HAS RE-USE VALUE!

● *Right away* you see more than sales appeal in this beautiful package *by Amos.* It becomes an exquisite chest—always a reminder *to remember* the packager!

The skill with which Amos reproduced the antique appearance of hand-carved ivory *will interest you especially.* Amos engineers designed the molds, produced them . . . and maintained quality control over production *every step of the way.*

Your plastics package *by Amos* gets experienced supervision. We're injection molding specialists . . . with complete facilities to serve you best. Write *without obligation.*

Amos did it . . . RIGHT!

Faithful reproduction of oriental craftsmanship and low cost were important to Alden Plastics Corp., 5th Ave. Bldg., N. Y.

Extreme care and ingenuity were used by Amos to eliminate all signs of modern high-production molding.

This is the second time this Eastern packaging specialist has come to Amos—again Amos did it . . . *right!*

Designed by R. W. DAILEY, *Eastern Representative*
Engineered by J. C. KAZIMIER, *Amos Chief Engineer*

Request your copy of the new Amos catalog soon to be published. It illustrates how our sales and engineering facilities are organized . . . and why you'll get the best service *at Amos.*

AMOS MOLDED PLASTICS
Edinburgh, Indiana
Division of Amos-Thompson Corporation

Amos
MOLDED PLASTICS...
Custom Molders
Plastic parts and products
Injection Molding Specialists

AMOS *Quality Control* MEANS REAL SATISFACTION

. . . and it's "Sales-Packaged" in an *Arnrus* PLASTIC CASE

By air, by train, American business men travel farther and faster these days. That's why McKesson & Robbins is "traveling ahead" with TAWN . . . a unique and sales-compelling travel kit . . . "sales-packaged" in waterproof Vinyl plastic film by *Arnrus*.

Compact, sturdy, luxurious and satin-smooth — yet thoroughly economical — "sales-packaging" by *Arnrus* helps products to "travel ahead" in today's competitive markets. *Arnrus* "sales-packages" are expressly tailored to fit!

If your product is adaptable to "sales-packaging," write for further information. Better still, send us a sample of your product . . . we'll design a sales-compelling unit that's ready for market.

- Transparent acetate boxes
- "Sales-Packaged" Plastic Cases
- Plastic covering for industrial and consumer products of all types

IT'S RIGHT-IF IT'S *Arnrus*

OVENS AND DRYERS

MODEL NO. 1
Single Door: Width 24½"
Five trays 15" x 22" x 2½"
Height 50" — Depth 28½"
Heating Element 1800 watts.
Thermostatic Control 100° to 300°F.

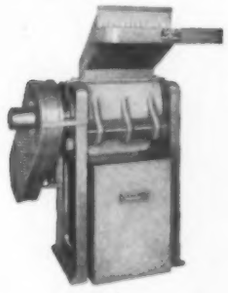
MODEL NO. 3
Double Decker: Width 48"
Height 68½" — Depth 28½"
Twenty Trays 15" x 22" x 2½"

MODEL NO. 2
Double Door: Width 48"
Height 50" — Depth 28½"
Ten trays 15" x 22" x 2½"
Heating Element 3600 watts.
Thermostatic Control 100° to 300°F.

Model No. 3 is two Model 2 units placed one above the other. They can be operated independently of each other and the top unit can be used in reverse position whenever desired.

RUGGED, made to last . . . EFFICIENT, economical to use

The trays are of such size and design to hold approximately 10 pounds of the average material when placed to a depth of about one inch. Special trays of expanded metal allowing greater circulation of heat can be supplied and are recommended for the pre-heating of pellets and other solid objects. For special uses the trays, or the entire unit if required, can be made of stainless steel, monel metal or nickel. Sturdy in construction, built of steel sheeting, carefully and thoroughly insulated with rock-wool insulation placed between the inside and outside shells of the dryer. Mounted on casters for easy movement from one location to another in the plant. Simple and fast to operate — *just plug in and turn the switch.*

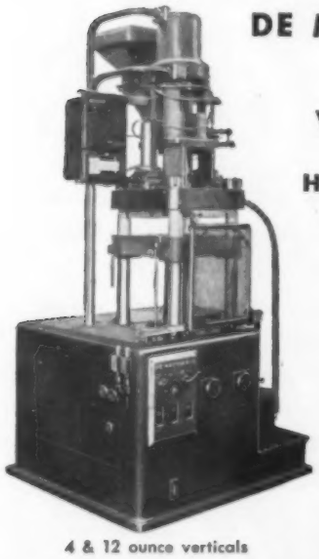


GRANULATOR — DE MATTIA — CHUNK CUTTER

For the uniform grinding of Vinylite, Geon and all hard thermoplastics.
Capacity: 200 lbs. per hr.
3 H.P. motor.

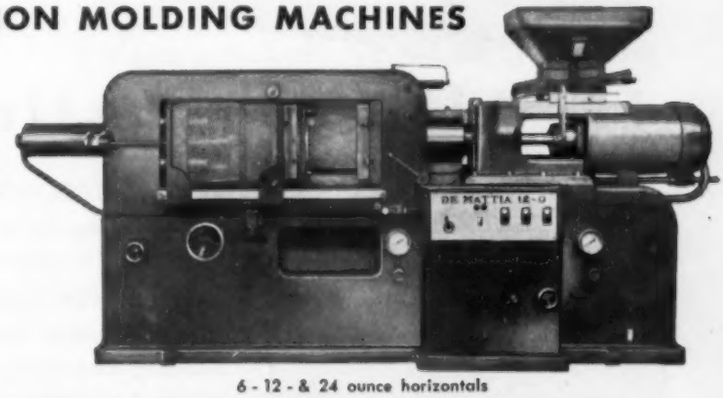
For low-cost salvage of larger slugs and chunks and molded pieces too tough for the average sprue and scrap grinder.
Capacity: over 150 lbs. per hr.
3 H.P. motor.

DE MATTIA INJECTION MOLDING MACHINES



4 & 12 ounce verticals

THE VERTICAL MACHINES HAVING HORIZONTAL PLATENS ARE PARTICULARLY ADAPTABLE TO INSERT WORK.



6 - 12 - & 24 ounce horizontals

— WITH THESE IMPORTANT DE MATTIA FEATURES:

SOLID BASE AND TENSION MEMBERS • ROLL-ACTION SOLID STEEL TOGGLES NO WRIST PINS • OPEN TYPE FEED FOR VISUAL INSPECTION • LARGE MOLD CLAMPING PRESSURE • HIGH INJECTION PRESSURE AND LARGE HEATING CYLINDER PLASTICIZING CAPACITY

Write for complete information

BROSITES MACHINE COMPANY INC.

50 CHURCH STREET — Cable Address—"Bromach" New York — NEW YORK 7, N. Y.

Telephone—Digby 9 3600

PERFECTION IN MOTION

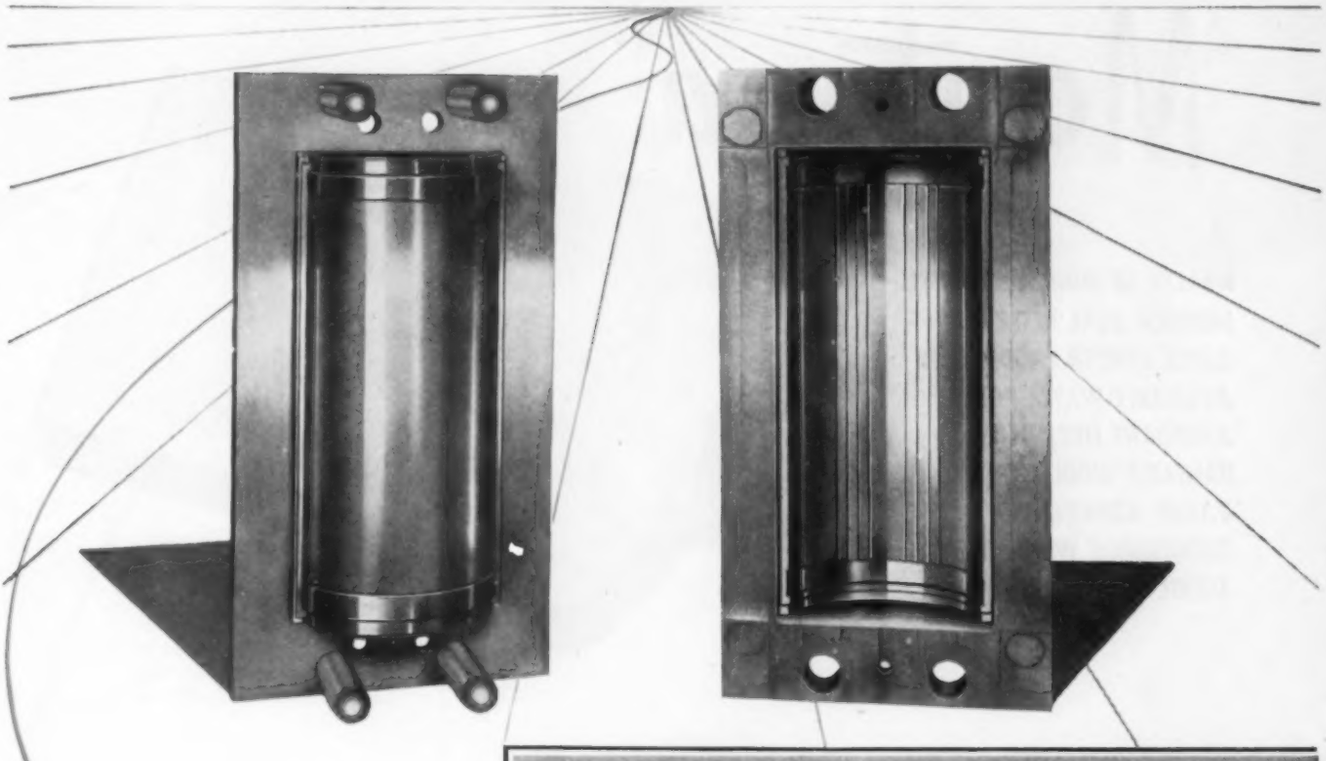
Motion demands precision. When plastic products . . . armatures . . . rotors . . . switches . . . valves . . . are in motion the need for precision is a first consideration. In the fields of injection, extrusion and compression molding, Michigan Molded has a 25 year experience background in this precision production. The same engineering and production talent that can achieve tolerances of as close as .002 inch, can give a uniformity to any production run. Next time, let Michigan Molded handle your plastic problem. Get acquainted with Michigan Molded Plastic's organization and see our modern production facilities.

M

MICHIGAN MOLDED PLASTICS, INC.

DEXTER, MICHIGAN

Finish, Accuracy in Plastic Molds



SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • HARDENED AND PRECISION GROUND PARTS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM HEATED PLASTIC MOLDS • SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

ALLIED WITH MASS PRODUCTION

PLASTIC molds produced at Allied are machined to meet the most exacting requirements for accuracy of form. Finishing operations produce surface finishes which conform exactly to the molder's specifications, assuring the required quality appearance of every completed part. Whether your demands for molds are ordinary or unusual, we will be glad to submit quotations to you.

ALLIED PRODUCTS CORPORATION

DEPARTMENT 1-P

4622 LAWTON AVENUE DETROIT 8, MICHIGAN

ALLIED CORPORATION PRODUCTS — PRECISION • EXPERIENCE • DEPENDABILITY

UNION PACIFIC

TREASURE MAP OF INDUSTRY

Montana*

WEALTH OF MINERAL DEPOSITS
IMMENSE COAL RESERVES
LARGE LUMBER PRODUCTION
AVAILABLE WATER POWER
ABUNDANT LIVESTOCK
VALUABLE WOOL CLIP
VARIED AGRICULTURE
TREMENDOUS WHEAT YIELD
SCENIC BEAUTY

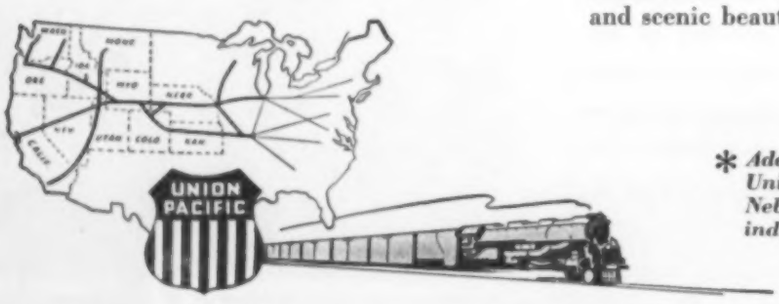
* *One of a series of advertisements based on industrial opportunities in the states served by the Union Pacific Railroad.*

Known as the "Treasure State," Montana is richly endowed with raw materials essential to industrial production. Among the many metallic minerals are silver, copper, lead, manganese, chromium and molybdenum. Coal reserves have been estimated at over 400 billion tons. The majority of the state's cities are supplied with natural gas.

Montana is a top producer of cattle and sheep, the annual sheep production being approximately two million head with a wool clip of great value. In agriculture, wheat takes first rank among grains. Sugar beets, potatoes, together with other vegetables, are grown on its farms. There are many thousand acres of forests, principally pine.

The Union Pacific Railroad serves Butte in the heart of the great mining area, and West Yellowstone—most popular rail entrance to the famous Yellowstone National Park.

Montana welcomes new industry. It has the space, materials, facilities and manpower to encourage firms seeking new locations. Additional advantages are good living conditions, an excellent educational system and scenic beauty.



* *Address Industrial Department, Union Pacific Railroad, Omaha 2, Nebr., for information regarding industrial sites.*

UNION PACIFIC RAILROAD

THE STRATEGIC MIDDLE ROUTE

BAKER PLASTICIZERS

IMPART

Retained Flexibility

TO

VINYL RESINS — CELLULOSE RESINS

PHENOL FORMALDEHYDE RESINS

MELAMINE RESINS — STYRENE RESINS

UREA FORMALDEHYDE RESINS

AND

GR-S — GR-N — GR-M

THE BAKER CASTOR OIL COMPANY

Established 1857

120 Broadway, New York 5, New York

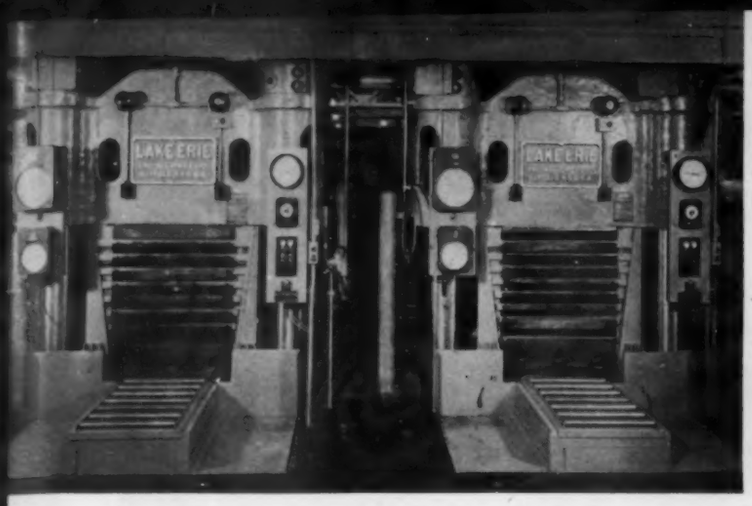
Chicago, Illinois — Los Angeles, California

LAKE ERIE PRESSES serve Leading Molders

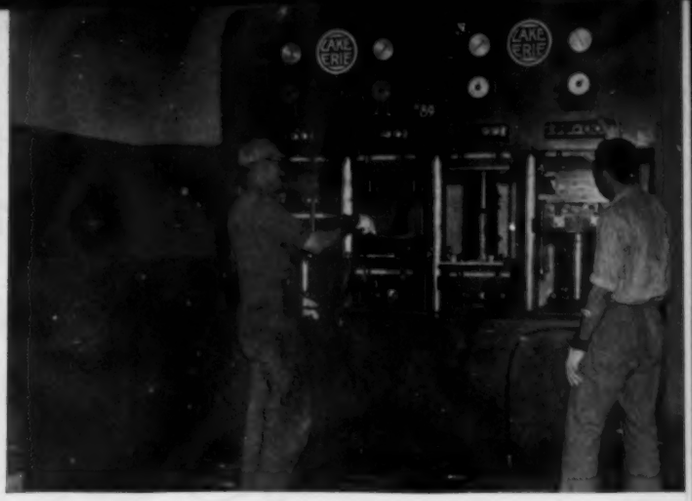
200-ton Lake Erie compression press producing telephone handset handles in the Stromberg-Carlson plant in Rochester, N. Y.

576-ton Lake Erie compression press molding 10½ lb. Admiral Radio cabinets in the Molded Products Company plant in Chicago.

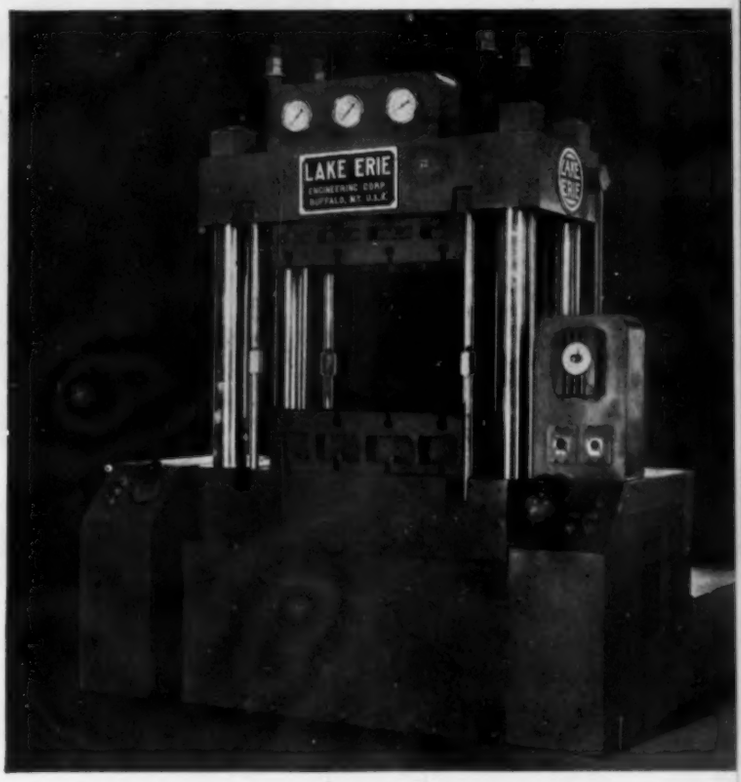
300-ton Lake Erie downstroke duplex press molding ringer bobbins in the Federal Telephone and Radio Corp. plant in Newark, N. J.



A pair of 2,500-ton Lake Erie laminating presses installed in the plant of a prominent electrical equipment manufacturer.



50-ton Lake Erie multiple-unit, semi-automatic press producing tableware at Plastics Manufacturing Company, Dallas, Texas



New high speed Lake Erie upstroke duplex press with 200-ton main ram, 50-ton duplex ram inside main ram and 10-ton pullback.

15-ton Lake Erie mobility test press used in the laboratory of Durez Plastics & Chemicals, Inc., North Tonawanda, New York.

Lake Erie offers a complete line of compression, duplex, laboratory and test presses to the plastics industry. The many models available include automatic, semi-automatic and manually operated types...multi-unit, self-contained and accumulator operated presses. A few of the many types and sizes used by leading molders are shown on these pages. Standard models are available for early delivery. Special models are quickly engineered to order when required. Presses manufactured by Lake Erie are noted for their clean, efficient design, sturdy construction, fast operation and reliable performance. Write for Bulletin illustrating and describing the complete line of Lake Erie molding presses. Or let us know your requirements and our engineers will recommend a press to meet your specific needs. No obligation.

●Leading manufacturer of hydraulic presses—all sizes and types—plastics molding... metal working... forging ...metal extrusion ...processing...rubber vulcanizing... stereotyping... special purpose.

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

LAKE ERIE
ENGINEERING CORPORATION
MANUFACTURERS OF
HYDRAULIC PRESSES AND SPECIAL MACHINERY

★

General Offices and Plant:
868 Woodward Avenue Buffalo 17, N.Y.

OFFICES IN PRINCIPAL CITIES AND FOREIGN COUNTRIES

P·I·P TRADE MARK

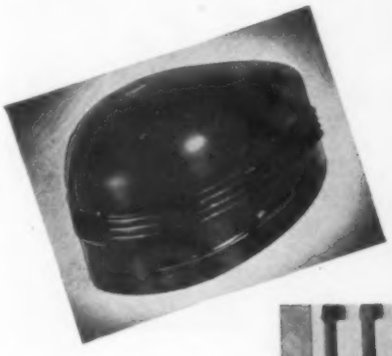
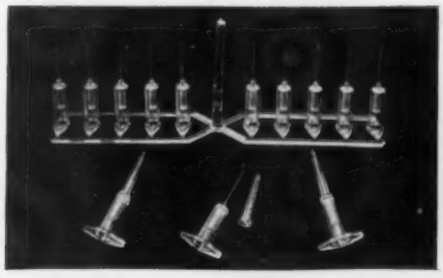
Presque Isle Plastics, Inc.

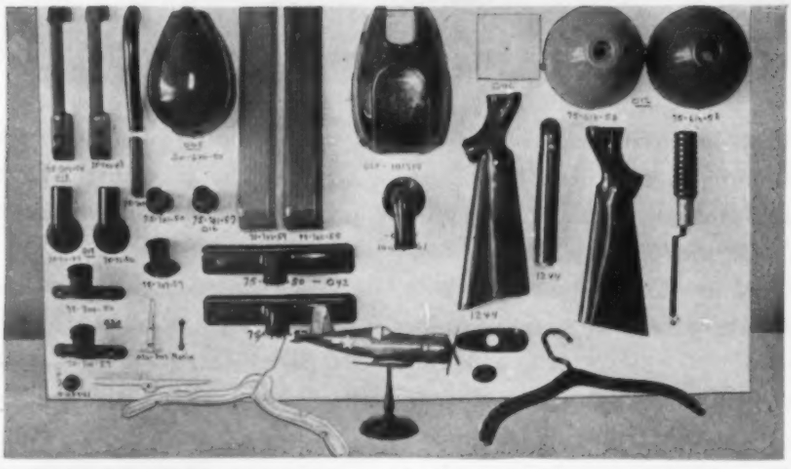
CUSTOM MOULDERS - SPECIALISTS IN LARGE CASTINGS

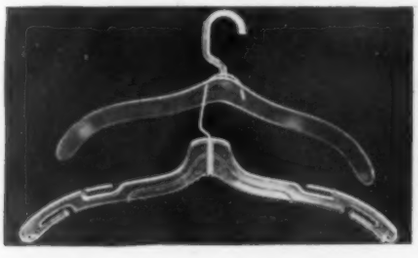
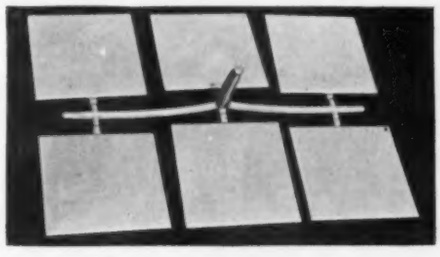
2730 WEST 12TH ST., - ERIE, PENNA.

Presents

EXPERTLY MOLDED PARTS

OUR ENGINEERS ARE EXPERTS IN ORIGINAL DESIGN, AND WILL ASSIST YOU IN WORKING OUT YOUR SPECIAL PROBLEMS WITHOUT OBLIGATION

LATEST EQUIPMENT INCLUDES } 2-16 oz. · 1-22 oz. · 1-12 oz. and 1-4 oz. PRESSES

For complete service from an idea to a manufactured part, call or write

DEEP HOLES, SHORT CYCLES, LOW COST

One of the important advantages of Transfer molding is that deep holes may be safely and precisely formed in a plastic part. This was the primary reason Shaw used this process for the phenolic base which holds five pencils in Scripto's Color Caddy.

Transfer molding also made it possible to produce the holder with minimum mold investment and in very short molding cycles. Topping off these economic advantages is the fact that Transfer molding produces parts uniform in strength and better in appearance.

The Scripto pencil holder is another demonstration of Shaw's ability to analyze the details of any molding problem — and come up with an answer that offers the maximum benefit to the customer. Consult Shaw on your next plastics application.

SHAW

SHAW INSULATOR COMPANY

MOLDERS QUALITY MARK ON MOLDED PLASTICS SINCE 1892

160 COIT STREET IRVINGTON 11, N. J.

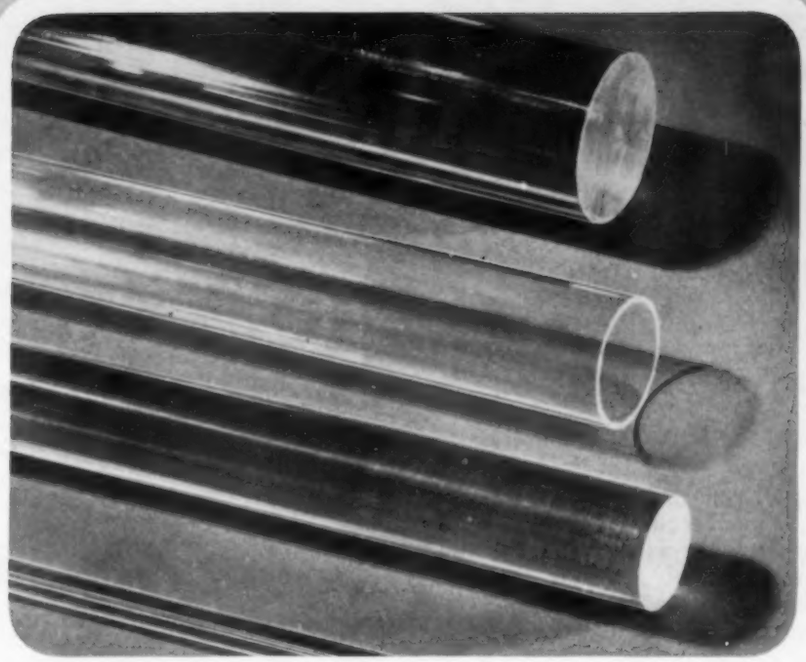
PLASTICS LITERATURE AVAILABLE

Shaw engineers have prepared a variety of literature, study of which might help you to a decision. Simply write a note about what phases of plastics especially interest you.

Or, you may prefer at once to call in a Shaw engineer, and present your problems for his study. This company's fifty-five years of plastics experience gives him a rich background from which you can draw.

Between the resources of Shaw and the Plax Corporation, Hartford 5, Conn., you can obtain assistance in almost all plastics methods and materials.

A "JEWEL" OF A PLASTIC



You can say that convincingly about Methacrylate from Plax — literally, too. Its unblemished crystal clearness makes it a top material for costume jewelry — fountain pen stocks — furniture — and many other products where jewel-like eye appeal is desired. It is also a scintillating display material.

On the industrial level, excellent optical and other characteristics have prompted its use in sight gauges, in chemical pipe and equipment. A versatile plastic, easily heat-formed into many different shapes, Methacrylate is a material well worth investigation — and Plax is probably the best source of help you can find.

CHART ON "HOW TO USE PLASTICS"

Now available for the asking is a table of properties for six materials available from Plax in various forms and formulae. This has been incorporated in the Plax catalog, which also contains helpful information on the primary uses of each material.

A copy will be sent promptly upon receipt of your request.

Between the resources of Shaw Insulator Company, Irvington 11, N. J., and Plax Corporation, Hartford 5, Conn., you can find help on virtually every material and method in plastics today.

PLAX
FOR PLASTICS
NOT SUBSTITUTES···IMPROVEMENTS

133 WALNUT STREET ★ HARTFORD 5, CONNECTICUT

DIISOBUTYL KETONE

Ketones

ETHYL BUTYL KETONE

Available in commercial quantities

—to give you formulating freedom

in the manufacture of lacquers and

synthetic resin coatings.

FORMULA	Diisobutyl Ketone $C_4H_9COC_4H_9$	Ethyl Butyl Ketone $C_4H_9COC_2H_5$
Boiling Point at 760 mm. Hg	168.1°C.	147.8°C.
Toluene Dilution Ratio at 20°C.	1.5	2.6
½ sec. R.S. Nitrocellulose Viscosity, 18% "Vinylite" resin VYHH Solution	Gel Structure	112 cps
Evaporation Time (Butyl Acetate = 8 hr.)	44 hr.	14 hr.
Weight per gal. at 20°C.	6.73 lb.	6.8 lb.
Specific Gravity at 20/20°C.	0.8089	0.8197

DIISOBUTYL KETONE

Dispersant—Best all around resin dispersant available for making organosols based on VINYLITE resin VYNV. Makes possible semi-hard and hard metal coatings containing little or no plasticizer, and aids in the preparation of highly plasticized coatings for cloth and paper.

Solvent—Retards premature evaporation in brushing lacquers, and reduces blushing in air-dried lacquers. Gives better flow-out and gloss to baked finishes.

ETHYL BUTYL KETONE

Dispersant—Produces fluid organosols having good viscosity stability on aging. Permits high solids content and makes good, clear films without checking ("mud cracking").

Solvent—Good solvent in both air-dried and baked finishes based on nitrocellulose or vinyl resins. Less active in lifting undercoats.

Intermediates—When condensed with amines and other chemical groups capable of reacting with the carbonyl group, these ketones give compounds of interest as inhibitors, rubber accelerators, dyes, pharmaceuticals, and insecticides. Ask for technical literature on diisobutyl ketone F-6934, and ethyl butyl ketone F-6918—when writing please address Dept. L-11

The word "Vinylite" is a registered trade-mark of Carbide and Carbon Chemicals Corporation.

CARBIDE and CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Principal Cities

In Canada:

Carbide and Carbon Chemicals, Limited, Toronto

PRODUCTIVE LIGHTING IS *Controlled* BY EACH USER ... FOR EACH OCCASION

Trained eyes and hands have an ally in the Dazor *Floating* Lamp, whether they're teamed in the first-aid room, at a high-speed machine or across an executive desk. By *floating* the light to the best position for seeing, the user completely controls intensity and position. And a finger-tip touch *changes* either, each time the job requirements change.

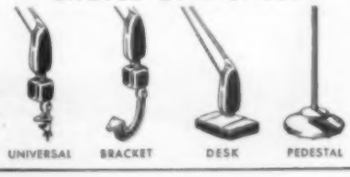
If you are accustomed to stationary lighting, or a lamp of restricted motion, the free movement of light in *all planes* will intrigue you. Dazor alone has the patented *Floating* Arm and its device for holding the reflector firmly, without locking or manual tightening.

But more important than the *how* is the *why* of Dazor illumination. Employees who enjoy this comfortable, glareless lighting see fine details more clearly on machining, assembly, inspection, drafting and other exacting operations. As errors and hazards decline, there is a rise in morale. Special skills come to the front and productivity shows a gain.

Phone Your Dazor Distributor for typical applications by other users or an on-the-spot demonstration. For the name of this nearby lighting authority, if unknown to you, write to Dazor Manufacturing Corp., 4481-87 Duncan Ave., St. Louis 10, Mo. *In Canada* address inquiries to Amalgamated Electric Corporation Limited, Toronto 6, Ontario.

MOVES FREELY INTO ANY POSITION AND STAYS PUT — *WITHOUT LOCKING*

CHOICE OF 4 BASES



DAZOR FLOATING LAMPS

FLUORESCENT and INCANDESCENT

IT takes a tough filament to weave an upholstery fabric that defies the hard wear it must take in automobiles or in public places. Resistance to dirt and chemicals, glorious colors, easy workability . . . these are added points of sale that give SARAN top rating in innumerable upholstery applications.

Available now in greater quantities and in diameters as fine as .005", there's every reason for the growing swing to SARAN.

SARAN BY NATIONAL denotes monofilament, tape and rattan manufactured by The National Plastic Products Company from Saran, a vinylidene chloride copolymer made by The Dow Chemical Company and supplied to mills, weavers and other fabricators for specific end uses.

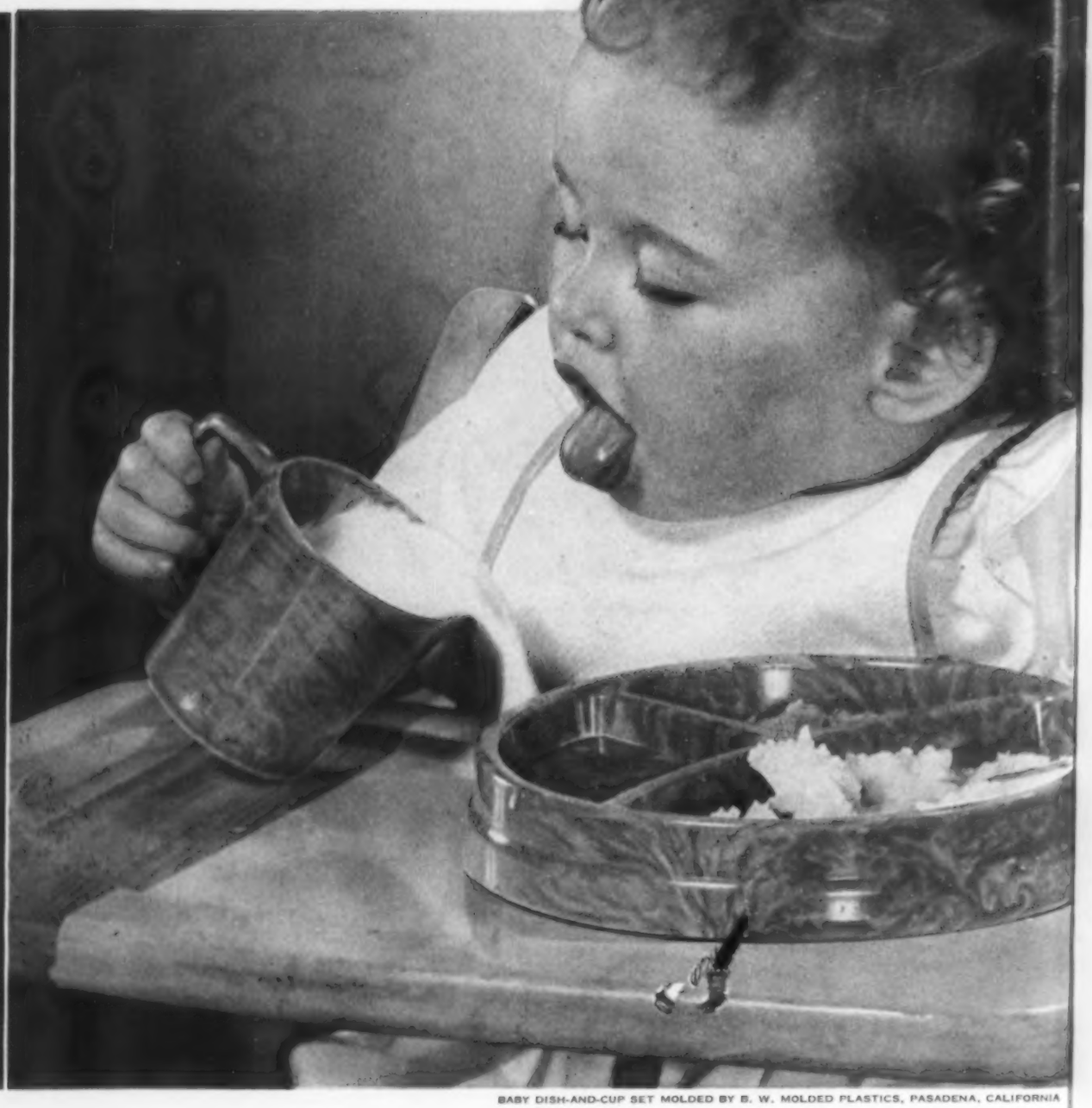
The NATIONAL Plastic Products Company

ODENTON • MARYLAND

NEW YORK: EMPIRE STATE BUILDING • LOS ANGELES: BANKERS BUILDING

STYRON . . . the right plastic!

right from the start!



BABY DISH-AND-CUP SET MOLDED BY B. W. MOLDED PLASTICS, PASADENA, CALIFORNIA

- **Development** *of polystyrene is one of Dow's greatest plastics achievements.*
- **Production** *capacity of Styron (Dow Polystyrene) has expanded 10 times over prewar capacity.*
- **Engineering** *assistance on Styron applications is a regular service of Dow and skilled molders.*

For babies and businessmen—it's never too early for Styron! This fine low-cost plastic (Dow Polystyrene) has qualities that even an infant can grasp. Styron is colorful, smooth, and warm to the touch. And the deeper you look, the more *you* will find to your profit. For with all its remarkable beauty—its fine serviceability—Styron offers economic advantages all its own. Styron's low price gives you lower production costs; moreover its lightness means more pieces per pound. Any wonder that more and more manufacturers now place it *first* among sales-making materials? A call to Dow can mean new markets—for *you!*

PLASTICS DIVISION • **THE DOW CHEMICAL COMPANY** • **Midland, Michigan**

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Ontario

DOW Plastics

MAN WANTED!

Must know how to push button!

WHERE uniform high quality demands that nothing be left to chance, you can depend on this Taylor Control System. It gives you *complete control* of sequence and duration of operations plus *complete control* of platen temperature and condensate removal. Once the operator pushes a starter button, here's what this system does:

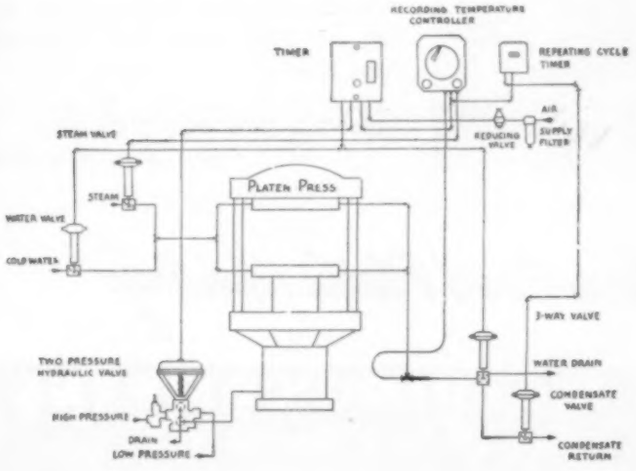
1. Controls all timing sequences from the moment the press is started until the finished product is ready for removal.

2. Controls temperature during the heating cycle. Also controls automatic change-over to cooling (where necessary) at the end of the molding period.

3. Provides automatic removal of condensate during the heating cycle, requiring no separate traps.

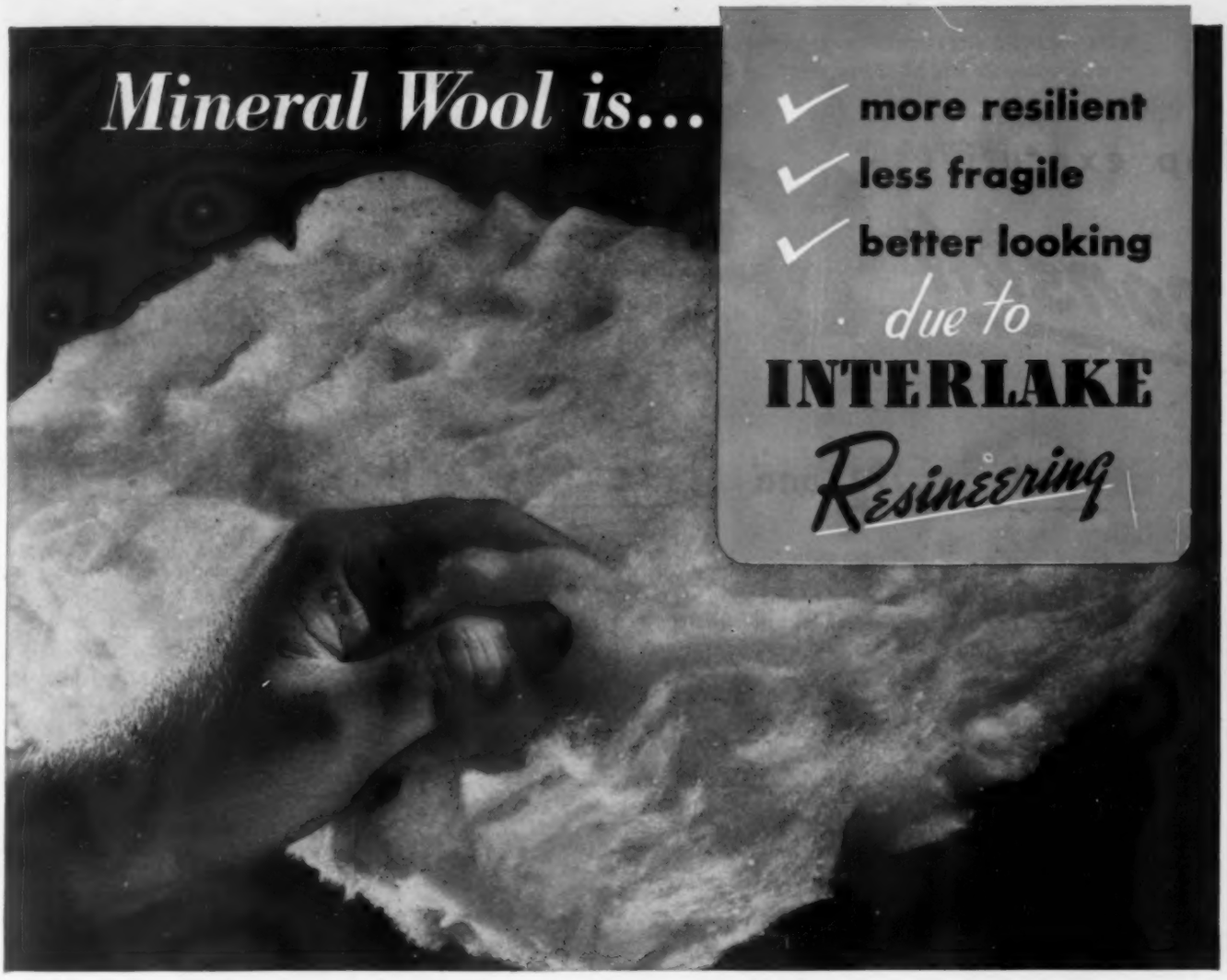
4. Provides automatic "bumping" or "gassing" (when necessary).

This system is so flexible that you can change the time cycle without cutting of cams. And you can change the molding period independent of the balance of the cycle by means of the Auxiliary Timer. *And*, the Fulscope Temperature Controller is fully adjustable for all temperature changes within its range. Interested? Ask your Taylor Field Engineer! Taylor Instrument Companies, Rochester, N. Y., and Toronto, Ontario.



Instruments for indicating, recording, and controlling temperature, pressure, humidity, flow and liquid level.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY



These are some of the benefits mineral wool manufacturers have gained from Interlake *Resineering*—the functional engineering of a resin for the exact requirements of each job. Through this service, Interlake developed a specific resin for bonding mineral wool. This resin, compounded into Interlake 4257 Liquid Glue, is always uniform and dependable, costs no more, and helps insure a top-quality product.

Equally valuable in other applications of resins for bonding, coating, laminating or impregnating, Interlake *Resineering* consists of:

1. **Thorough analysis of your resin problem followed by our recommendation.**
2. **Development of a resin for your particular application.**
3. **Testing this resin on the job, in *your* plant, working with *your* operating men.**
4. **Stabilizing its production for continuous uniformity in performance.**

Call in an Interlake *"Resineer"*—draw on his experience to solve your resin problems. Write Interlake Chemical Corporation, Union Commerce Bldg., Cleveland 14, Ohio.

INTERLAKE CHEMICAL
Corporation
• PRODUCTS FROM COAL •

"This advertising message, appearing in 4-color cover position in BUSINESS WEEK and U. S. NEWS, is developing business for Monsanto Lustron molders and fabricators."

Molded by Worcester Moulded Plastics Co., Worcester, Mass., for Barcalo Manufacturing Co., Buffalo, New York.

when you use LUSTRON

A MONSANTO PLASTIC

finishing comes "FREE"

Finishing operations are practically eliminated, that's why so many cost-wise manufacturers select Lustron for their material today.

Expensive painting and enameling, with its several preparatory steps and multiple coats, plus necessary drying or baking is entirely eliminated. A Lustron product or part, when it pops from the mirror-bright surfaces of the die, is *molded and finished* in the single operation. The color is through-and-through; it can't peel, chip, crack or fade; the surface is sparkling clean and smooth.

For example, the manufacturer of this chair arm, with alternative material, would have paid for at least five separate finishing operations, plus cost of materials and inspection of each step.

At the same time he eliminated finishing costs with Lustron, he eliminated machining costs, and even the metal inserts were molded in. He enjoyed a full choice of colors, he got an arm with a pleasant, friendly "feel", his chair arm is resistant to alkalies, acids, water, it's sturdy and strong. And because Lustron's light in weight and low cost, too, he got more product for his material dollar.

If *you* are sharpening up your figures on production costs, it will pay you to look into Monsanto's versatile polystyrene, Lustron. We will be glad to send you complete Lustron data and, as always at Monsanto, a technical staff is on hand to help you with particular problems. Address: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Mass. In Canada, Monsanto (Canada) Ltd., Montreal.

Lustron: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS · PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Common Sense Assembly Engineering

PUTS

Extra Savings

IN THE PRODUCTION PICTURE

NO INSERTS, NO TAPPING

Hinge, sidelocks and front frame were secured to the bakelite parts of this Beacon camera by 16 tamper-proof P-K Type "U" Screws pressed into blind, untapped holes. Two P-K Type "Z" Screws fasten the periscopic extension box.

● Fast, simplified assembly and dependable security are what Whitehouse Products had in mind when specifying P-K Self-tapping Screws for their smartly designed, inexpensive Beacon camera.

There were other ways of doing this job. Machine screws in inserts or tapped holes might have been employed. But, mold-slowing inserts would have boosted costs. Tapping the blind holes would have meant an extra operation, frequent breakage, slower production. With P-K Self-tapping Screws, fastening became the *simple* job of driving screws into plain, untapped holes, and light-proof fit of the plastic parts was preserved.

If you have a similar assembly, why do it the hard way when savings like these are so easily made with the P-K "short-cut" method? In seven out of ten metal or plastic fastening jobs, Parker-Kalon Self-tapping Screws offer a combination of ease, speed, security no other fastening method can match.

Isn't it worthwhile to question the fastenings on your products when so many manufacturers have cut assembly costs with P-K Self-tapping Screws — often as much as 50%. Whether your product is on the drafting board or in production, just call in a P-K Assembly Engineer and talk it over . . . or mail assembly details for recommendations. Parker-Kalon Corp., 200 Varick St., New York 14.

Sold Only Through Accredited Distributors

PARKER-KALON **SELF-TAPPING SCREWS**

A FASTENING FOR EVERY METAL AND PLASTIC ASSEMBLY

Time-tested Truth about plastics costs

CASE HISTORY FROM TRAVALARM

It's one of the smartest, best-selling traveling alarm clocks in the field—the Westclox Travalarm. Case is moulded in 5 parts of urea or phenolic—includes easily assembled front, back, end caps and ribbed flexible shutter. The unique shutter speaks volumes for Kurz-Kasch mould, design and manufacturing methods. And so do the moulds—still producing Travalarm cases in volume after 10 years of service.

HERE'S a perfect example of how to get full value out of your plastics dollar.

First, make sure that your application will benefit from plastics. In this case, plastics bettered eye-appeal, finger-appeal, sales-appeal. Plastics simplified manufacturing and assembly.

Then, call in skillful design and mould-making to complete the job. Here, design was so far-seeing—mould-making so precise—that now, almost 10 years later—Westclox maintains this model's popularity without any change in either! The *original moulds* are still in *quantity production.*

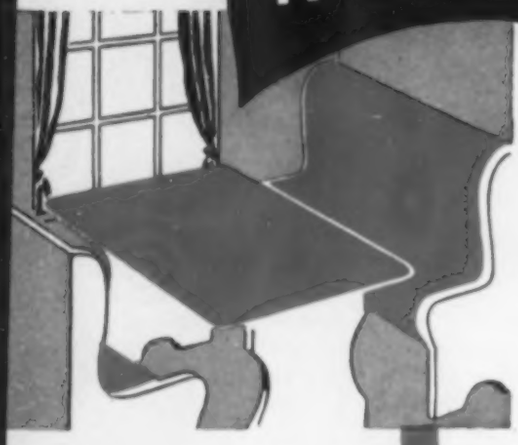
That's the way to make your dollar work when you buy plastics. And that's the kind of work we specialize in at Kurz-Kasch. We'll design, engineer, tool, mould and finish any job that can be made better in thermosetting materials. A Kurz-Kasch engineer will explain gladly—without obligation—if you ask.

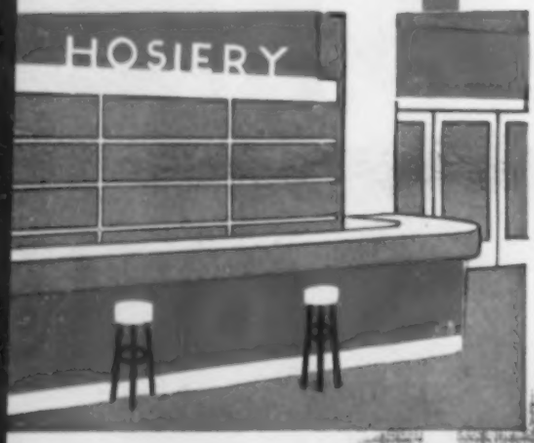
Kurz-Kasch

FOR OVER 31 YEARS PLANNERS AND MOULDERS IN PLASTICS

Kurz-Kasch, Inc. • 1415 South Broadway • Dayton 1, Ohio
BRANCH SALES OFFICES: New York, *Lexington 2-6677* • Chicago, *Harrison 5473*
Detroit, *Randolph 5214* • Los Angeles, *Prospect 7503* • Dallas, *Lakeside 1022*
St. Louis, *Rosedale 3542* • Toronto, Canada, *Adelaide 1377*
EXPORT OFFICES: 89 Broad Street, New York City, *Bowling Green 9-7751.*

WESTPLAK *is here*





THE NEW LOW-COST HIGH-DENSITY LAMINATE FOR TOPS — PANELS — WALL SURFACES

• EASY TO INSTALL

• AVAILABLE IN ROLLS OR SHEETS

WESTPLAK is the first decorative continuous laminate on the market available now in rolls or sheets of various thicknesses. It can be used for wall surfaces, table tops, furniture surfaces in stores, restaurants, theatres and institutions.

WESTPLAK won't crack, chip or dent. It is stain-proof, alcohol-proof, resists acids and is easy to clean. It withstands boiling water to degree never before obtained with a continuous laminate.

EASY TO INSTALL — With the aid of simple tools, the ordinary workman can install WESTPLAK. It can be bent cold around a 2" radius or, it can be heated and bent around a ½" radius. This means that for the first time a laminate can be easily installed on the job. This easy-to-install quality also makes WESTPLAK suitable for mass production methods.

AVAILABLE — There are, at present, 30 distributors located throughout the United States who have WESTPLAK in stock in standard sheet sizes and various thicknesses. It is available in blue linen, tan linen, red linen, solid red and solid black. Special patterns and colors can be supplied.

SIZES: Sheets are available in 6', 8', 10' and 12' lengths; in widths of 24", 30", 36" and 42". Thicknesses of 1/16", 1/32" and .015"

WESTERN PRODUCTS INCORPORATED

NEWARK OHIO

Look what you can do with WESTPLAK

YOU CAN HANDLE THE CURVES with perfect ease. The strip of WESTPLAK illustrated here was bent with the aid of a small amount of heat without any special equipment. This will illustrate how WESTPLAK can be installed on columns, radio cabinets, furniture, sink tops or curved bar or wall surfaces.

YOU CAN COVER LONG AREAS because WESTPLAK is available in continuous rolls. If your surface is 20 or 200 feet long, WESTPLAK will cover the job in one piece which eliminates fitting and joining. All the work can be done on the job.

COMPLETE INSTRUCTIONS AVAILABLE. For installing WESTPLAK an instruction book is supplied which lists the tools you need, tells, in simple, understandable language, how to lay out WESTPLAK, cut it and install it. Also gives suggestions for making simple bending equipment, sawing with power tools, cementing, molding and accessories.

Clip coupon and mail for free booklet on WESTPLAK.

Our engineering staff is available for consultation on industrial applications.

WESTPLAK

new plastic covering for

TABLES
COUNTERS
SINKS
DOOR PANELS
WALL PANELS

WESTERN PRODUCTS INCORPORATED
Newark, Ohio

Gentlemen:

WESTPLAK may help us reduce costs and improve appearance
We are interested in its use for.....

☐ Send us literature, ☐ prices, ☐ name of distributor near us

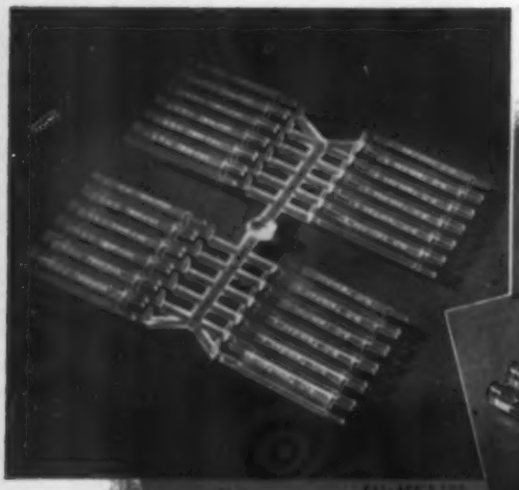
Name.....

Company.....

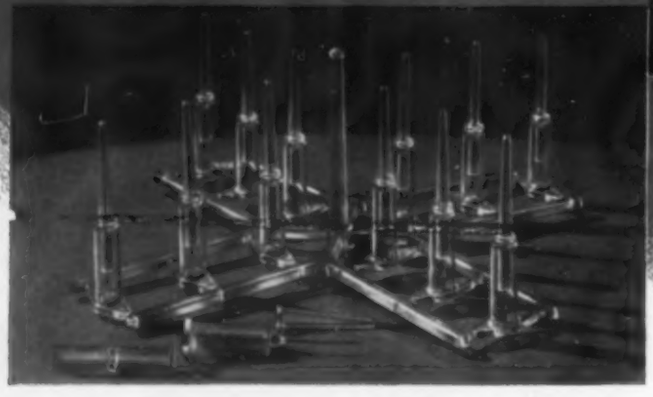
Address.....

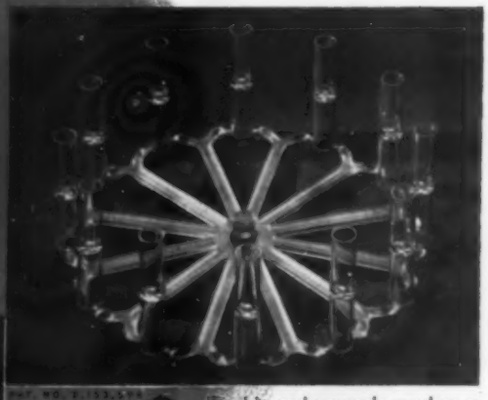
City..... Zone..... State.....

ERIE RESISTOR CUSTOM MOLDED *Plastics for Medics*



"Twin-Pak" Needle Holder molded of clear polystyrene, holds 2 needles each, as shown at the right.





Double end ampoule used as a penicillin cartridge for syringe in lower illustration. Molded of methyl-methacrylate.

Syringe assembly, showing sprue, runners and gates molded of cellulose acetate.

THE ingenuity of the inventor often calls for equal ingenuity on the part of the manufacturer, to put the design into practical production.

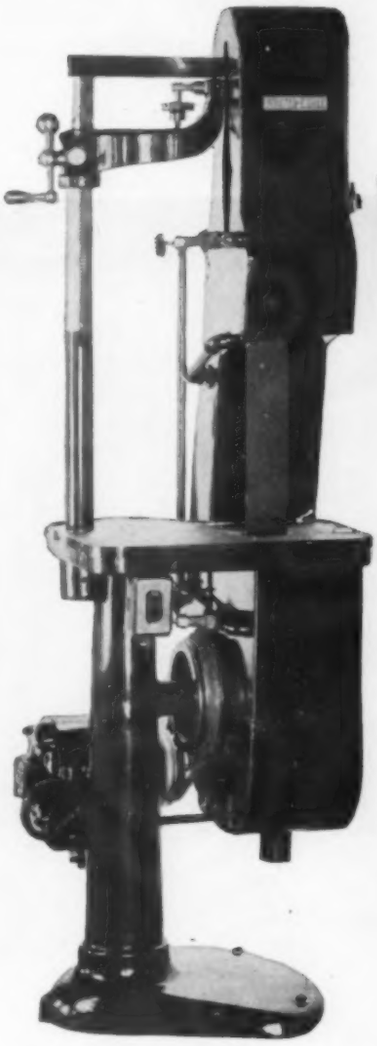
Such was the case when we were called upon to produce hypodermic syringes for Becton, Dickinson & Co., Rutherford, N. J., in which the needle was to be molded as an integral part of the plastic barrel, and the drug-containing plastic ampoule to be used as the plunger. The result is a syringe with a needle that does not loosen in use; a crystal clear product that is free of air-bubbles; an ampoule with flawless surface and close tolerances, that assure perfect functioning and interchangeability.

The Becton, Dickinson & Co. "Twin-Pak" needle holder is another instance of a unique and useful item, that could be molded at practical cost only through "know how" gained by experience and untrammeled by tradition.

However intricate your projected product, don't be persuaded that it can't be made by custom injection molding, until you have consulted Erie Resistor.

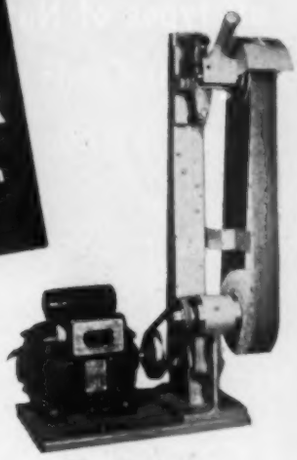
Plastics Division
ERIE RESISTOR CORP., ERIE, PA.
LONDON, ENGLAND • • TORONTO, CANADA

PREVENT FLOW.. Discoloration .. Distortion in Your PLASTIC OPERATIONS



PORTER-CABLE *Abrasive* BELT SURFACER

Speeds Clean-Up . . Increases Production
Improves Finish



For thermoplastics and some thermo-setting plastics, the Porter-Cable Surfacing Methods prevent main worries: flow, discoloration and distortion.

In Wet-Belt Surfacing, the coolant is sprayed on before and after cutting, and thus keeps the belt free and clean at all times. Furthermore, the grindings do not weld and load the belt because this method eliminates heat.

The Flexible Belt follows the contour of a piece. For long-run repeat operations, a padded platen fits the flexible belt to the exact contour of the job. Even spherical pieces can be smoothly finished.

MODEL CN-2 Uses dry belt. Grinds on contact wheel, platen or free belt. Arbor for V-type driving pulley permits use of this unit independent of a bench grinder Adjustable for vertical or horizontal use within 90° arc. Has Resilient Contact Wheel —Platen—Abrasive Belt—Idler—Motor Mounting (electric motor not included).

MODEL B-6W Cuts Cost and Improves Finish. Especially designed for curved or irregular work, this model will handle most jobs free-hand or with simple fixtures. You can make a single pass in a fraction of usual surfacing time.

MODEL WG-4 Does Most Operations Free-Hand! Porter-Cable's new all-around Wet-Belt Surfacer . . .. Ideal for light operations. Grinds flat on the platen—line contact grinding on the resilient contact roll. Has self-contained coolant system and re-circulating tank. Drawer traps all grindings and waste.

MODEL N-2 A belt grinder conversion attachment for bench grinders that increases output 200% over ordinary Abrasive Wheel. Quickly adjusted to either vertical or horizontal position.

Write today for FREE copy of "Production Man Speaks." It describes a process as new — as vital — as the plastics industry itself.

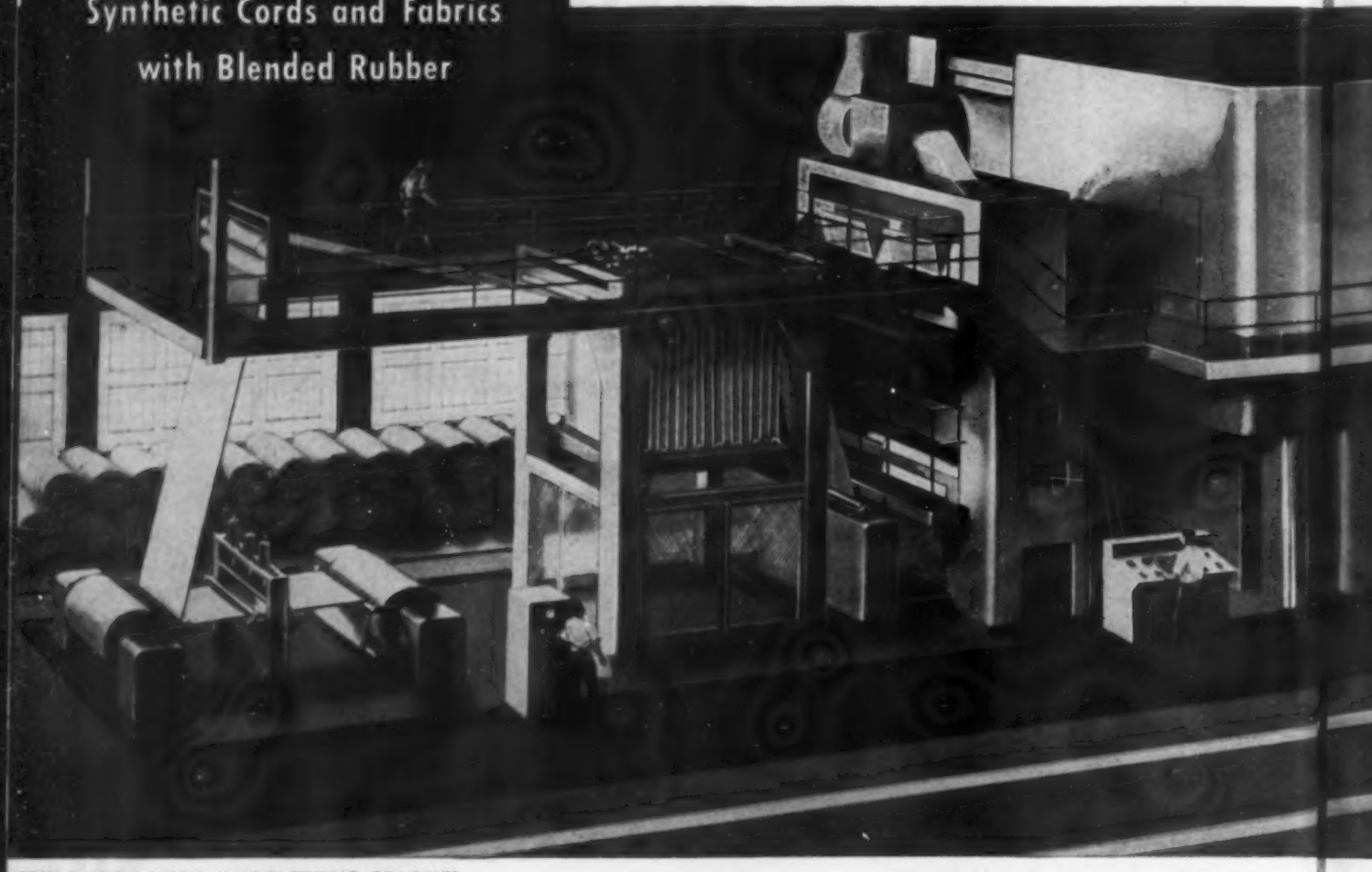
Send also for film: "Machine of the Age." Loaned FREE for factory staff meetings.

Every Model Saves You Money!

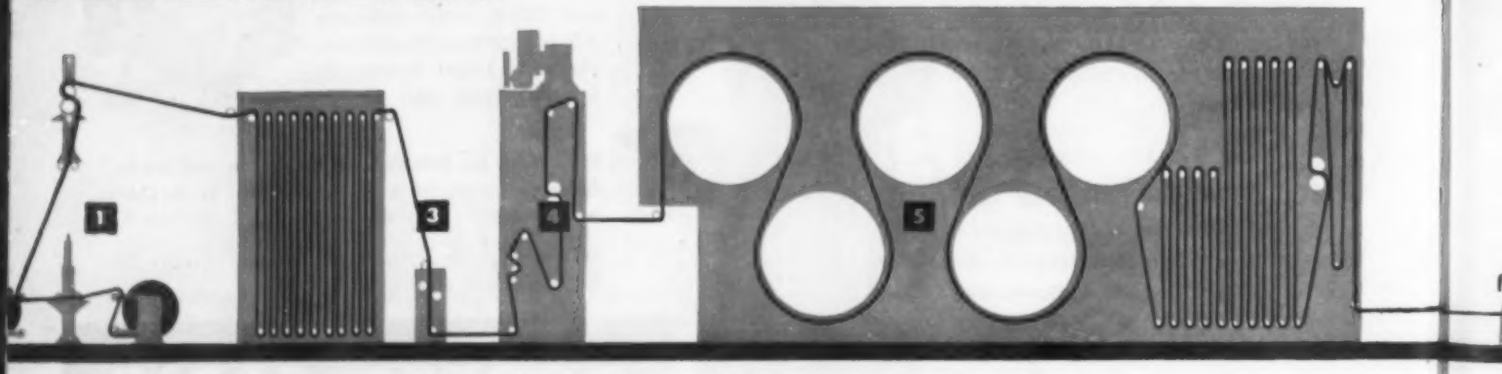
PORTER-CABLE
MACHINE COMPANY
1606-11 N. SALINA ST., SYRACUSE 8, N. Y.

Continuous and electronically

For the treatment of
all types of Natural and
Synthetic Cords and Fabrics
with Blended Rubber



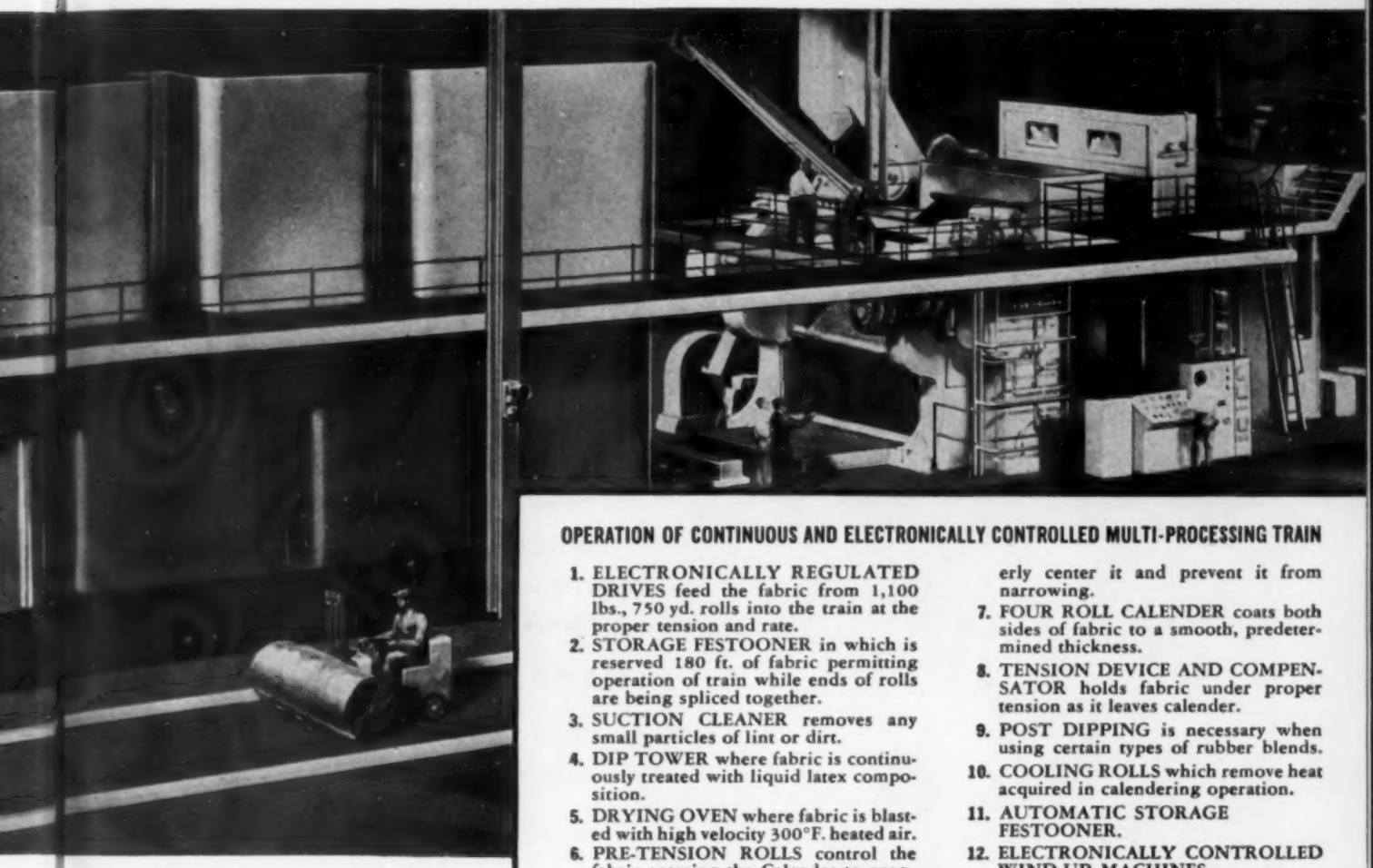
IRTESY DAYTON RUBBER MANUFACTURING COMPANY



This all electronically controlled tandem operation, *the first ever to be assembled,* treats all types of natural and synthetic cord fabrics with blended rubber in one continuous, high speed operation, eliminating the frequent re-handling of material in the many separate and slower operations formerly required. The unit adjusts to predetermined standards, by finger-tip control, the strength and elongation of the fabric, surrounding and impregnating each cord with blends of rubber. It dips, stretches, impregnates and coats at speeds up to 180 feet per minute. By synchronized electronic methods the highest quality of treated cords and fabrics is maintained to an exact degree of uniformity, with constant tension maintained at all points throughout the process.

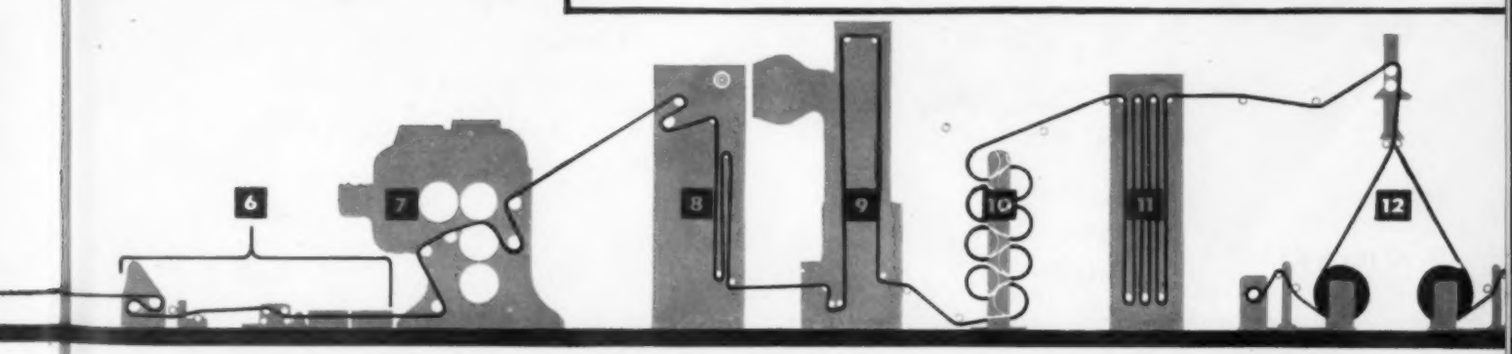
controlled multi-processing train

Recently designed, built and installed
by Adamson United Company
for a prominent Tire Manufacturer



OPERATION OF CONTINUOUS AND ELECTRONICALLY CONTROLLED MULTI-PROCESSING TRAIN

1. ELECTRONICALLY REGULATED DRIVES feed the fabric from 1,100 lbs., 750 yd. rolls into the train at the proper tension and rate.
2. STORAGE FESTOONER in which is reserved 180 ft. of fabric permitting operation of train while ends of rolls are being spliced together.
3. SUCTION CLEANER removes any small particles of lint or dirt.
4. DIP TOWER where fabric is continuously treated with liquid latex composition.
5. DRYING OVEN where fabric is blasted with high velocity 300°F. heated air.
6. PRE-TENSION ROLLS control the fabric entering the Calender to properly center it and prevent it from narrowing.
7. FOUR ROLL CALENDER coats both sides of fabric to a smooth, predetermined thickness.
8. TENSION DEVICE AND COMPENSATOR holds fabric under proper tension as it leaves calender.
9. POST DIPPING is necessary when using certain types of rubber blends.
10. COOLING ROLLS which remove heat acquired in calendering operation.
11. AUTOMATIC STORAGE FESTOONER.
12. ELECTRONICALLY CONTROLLED WIND-UP MACHINES.



Designing processes and building machinery to meet special or unusual requirements is our business. The experience and abilities of our engineering staff are available for your particular problems.

Adamson United Company

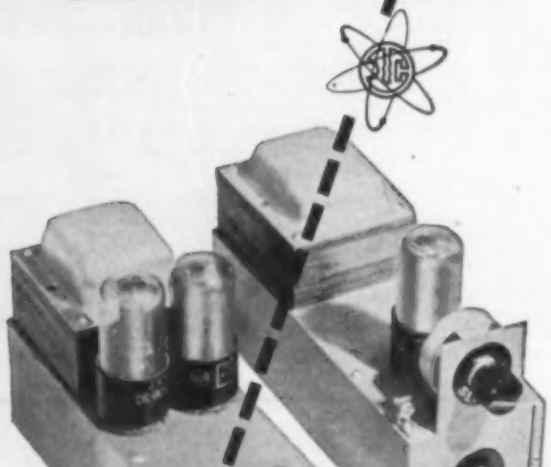
AKRON, OHIO

SALES OFFICES: New York—441 Lexington Ave. New York City • Chicago—140 S. Clark St., Chicago, Illinois
Paris—5 bis Rue Massenet, Paris 16e, France

Write for Descriptive Literature

Wheelco CAPACILOG

A NEW *Electronic* SCRIBER



4710

Wheelco, in creating the *"ELECTRONIC PRINCIPLE"* for pyrometric Control paved the way for faster, simpler and more accurate industrial Process Regulation.

Years of research, engineering and experience in practical application of Electronic Controls all over the world, now culminate in the production of the WHEELCO CAPACILOG, an electronic recording indicating or controlling instrument.

This simplified "ELECTRONIC SCRIBER" combines the "no-contact" features of the universally accepted Wheelco Capacitrol with a revolutionary mechanical design of rugged construction, perfected to fine watchmakers' precision.

The CAPACILOG is available as a *Deflection, Potentiometer* or *Resistance Thermometer Type Recorder, Recording Controller* or *Indicating Controller.*

CAPACILOG FEATURES

- **Wheelco "Electronic Principle"**
- **Direct Reading**
- **No Converters—No Relays**
- **Plug-In Chassis Design**
- **Multi-Tube Safety Factor**
- **Voltage Selector Plug**
- **Swing-Out Chart**
- **Automatic Chart Reroll**
- **Backlash Breaker**
- **Standard Electronic Tubes**

WHEELCO *Electronic* INSTRUMENTS

Recorders · Controllers · Combustion Safeguards

Wheelco Instruments Company, 875 W. Harrison St. Chicago 7, Ill.

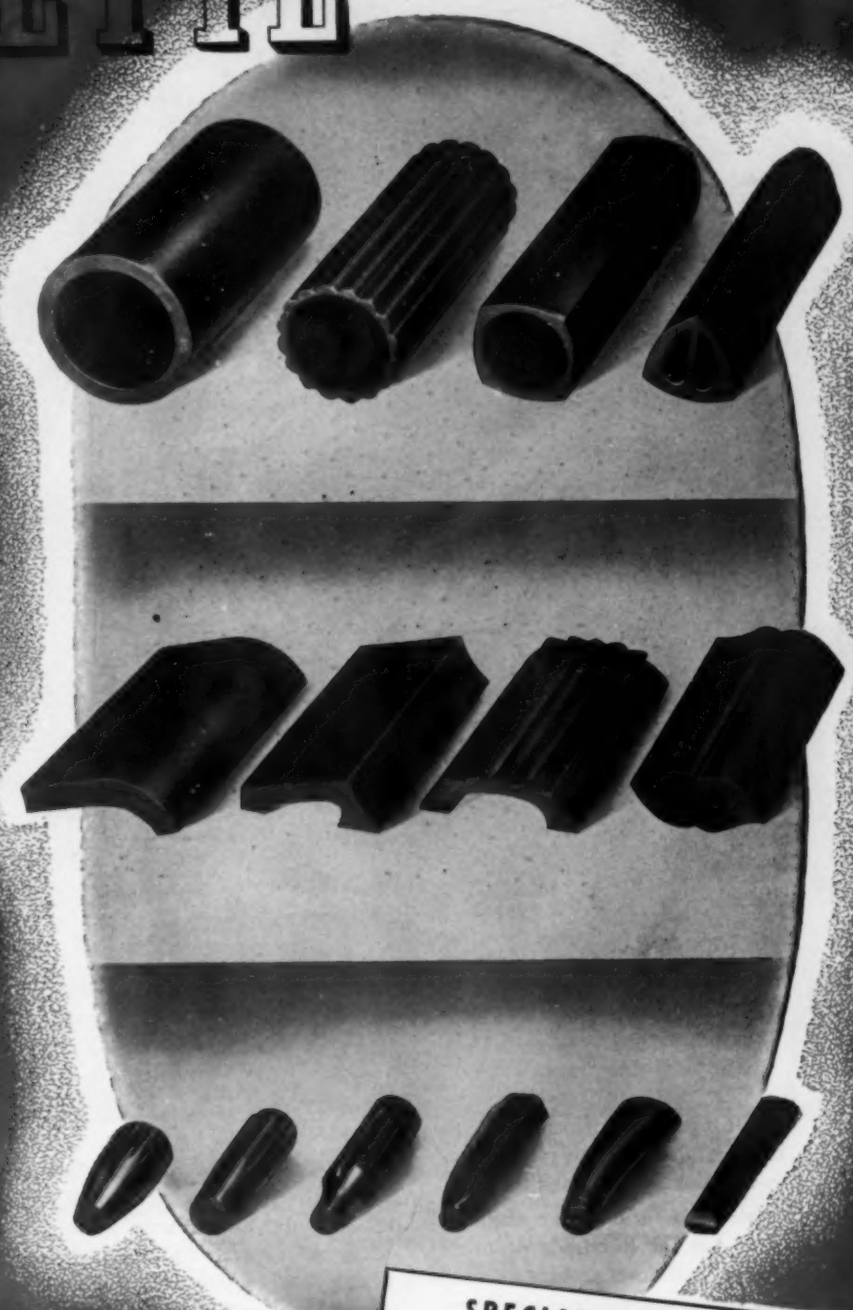
A CAST PHENOLIC RESIN OF EXCEPTIONAL QUALITIES

MARBLETTE

Outstanding among plastics, Marblette has a jewel-like depth and a complete color range which duplicates the appearance of precious stones, tortoise shell and ivory.

Its almost infinite variety of colors is available in transparent, translucent, opaque, or in mottled effects. Marblette also comes in a water clear form known as "Crystle" in a wide choice of colors.

Marblette's machining characteristics, resistance to oils and acids, non-inflammability and exciting beauty make it ideal for countless manufacturing needs.



MARBLETTE will help plan your world of tomorrow. The Marblette staff of engineers offers its services to help with your manufacturing problems. Write to us outlining your needs.

SPECIAL CASTINGS

Marblette is supplied in sheets, rods, tubes, and special castings such as cutlery handles, kitchen utensil handles, pipe stems, cigarette holders, clock cases, automotive trimmings, jewelry items, buckles, etc. Special shapes made to customer's specifications can be supplied provided draft is all one way.

THE MARBLETTE CORPORATION

Manufacturers of Phenolic Resins since 1929

37-21 THIRTIETH ST., LONG ISLAND CITY 1, N. Y.

Dillon-Beck finds Acetate the best!

Fish lures and hook pack molded by Dillon-Beck Mfg. Co., Hillside, N. J., from cellulose acetate supplied by Chemaco Corporation.

WHEN fishing tackle manufacturers require plastic moldings, many of the leaders go to Dillon-Beck Manufacturing Company. Dillon-Beck, in turn, uses *cellulose acetate* plastics *exclusively* for such applications.

For fish lures and other anglers' accessories—as for hundreds of other applications, cellulose acetate is used primarily for its outstanding toughness and durability.

These qualities may be judged many ways. In addition to withstanding hard knocks in use, cellulose acetate is economical—by eliminating breakage during manufacture and assembly. Fast and easy to mold, cellulose acetate can be drilled, threaded, and machined without shattering.

The dimensional stability of cellulose acetate (better than ever in new formulations) also contributes to the durability of acetate moldings. Closely-fitting parts may be formed to precision dimensions, and metal inserts may be embedded, with assurance that these components will not loosen in service. Moisture resistance of the material is obvious from this application.

Cellulose acetate was selected also for its permanent finish, its wide range of colors, and the crystal-clear effect required in the body of the lures. All together, these properties indicate why more and more manufacturers of products ranging from vacuum cleaners to electric switches specify the cellulosics.

While Hercules does not make cellulosic plastics or molding powder, we will be glad to send you helpful technical literature on the Hercules base materials from which they are made.

HERCULES POWDER COMPANY
INCORPORATED
916 Market Street, Wilmington 99, Delaware

CPT-11

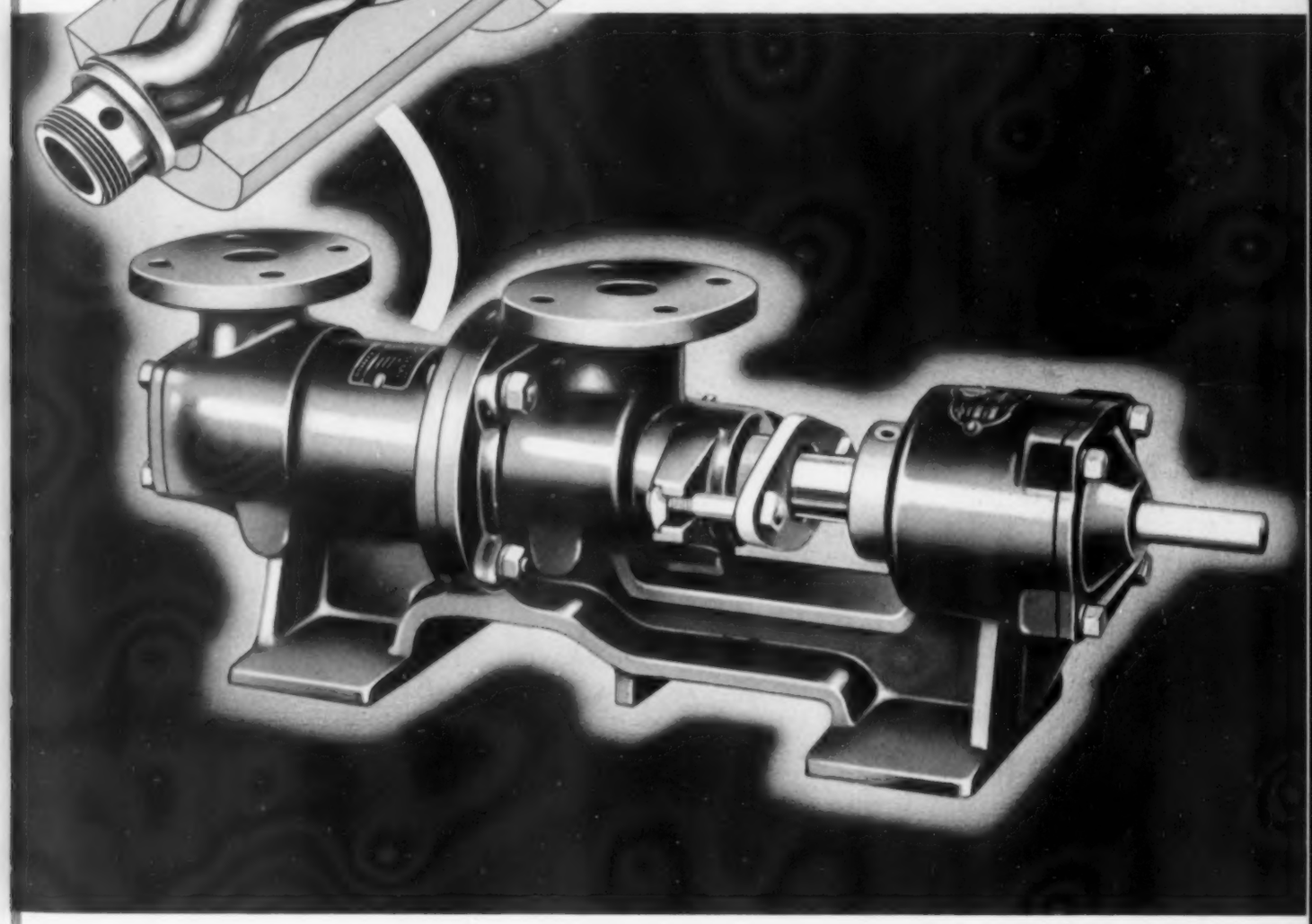
Save and Sell with Cellulosic Plastics

CELLULOSE ACETATE • ETHYL CELLULOSE • NITROCELLULOSE

Plastics where plastics belong for resistance to corrosion and wear

An unusual combination of mechanical, electrical, and chemical properties make Synthane (our type of plastics) practicable for a limitless number of uses. For example, Synthane is an excellent electrical insulator, structurally strong, and extremely light (½ the weight of aluminum). It is wear, corrosion, and moisture resistant, may be easily machined.

The stator of this unique pump is a top-notch example of plastics rightly used . . .



Handling a wide variety of materials, this application seriously tests corrosion and wear resistant qualities. Synthane stoutly resists the attack of many corrosive solutions and opposes the scrubbing action of pulp and small solids.

If you have an application for which Synthane seems the answer, let us know about it—before you design if possible. We are eager to help you choose the right job for plastics and the right plastics for the job. Write for our complete plastics catalog today!
Synthane Corporation, 8 River Road, Oaks, Penna.

SYNTHANE ***where Synthane belongs***

DESIGN · MATERIALS · FABRICATION · SHEETS · RODS · TUBES
FABRICATED PARTS · MOLDED · MACERATED · MOLDED-LAMINATED

SOME QUICK FACTS ABOUT SYNTHANE RODS AND TUBES

Diameters: Rod—⅛" to 4" O.D. (Larger diameters turned from sheet material.)
Tubing—⅛" to 22" I.D., O.D. to specifications. (Molded tubing to 4" O.D. only.)

Lengths: 18" and 36", longer on order

Colors: Natural (tan) or black

Finishes: Ground, buffed or varnished

For diameter or wall thickness tolerances, standards of quality for tensile and compressive strength, dielectric strength, density, percent of moisture absorption, power factor and dielectric constant, write for descriptive Tubing Folder.

DESIRABLE PROPERTIES OF SYNTHANE TUBES

- Non-metallic
- Light Weight (⅙ the weight of aluminum)
- Structurally strong
- Moisture Resistant
- Thermosetting
- Low Coefficient of Expansion
- Corrosion Resistant
- Excellent Electrical Insulator
- Hard, abrasion resistant
- Resilient
- Sound and Vibration Absorbing
- Easy to machine

Once it is learned how many properties are *combined* in Synthane—what sizes, and grades are available, and how easy Synthane is to machine, many new, profitable, uses for Synthane tubing and rods pop up quickly. Here, in a light weight non-metal that is an excellent electrical insulator, are all the characteristics for making thousands of products *better, faster* or *more economically.*

Synthane's plant capacity assures you a steady flow of top-quality rods and tubes or close-tolerance parts fabricated from these versatile materials.

Why not find out for yourself how Synthane rods and tubing can help you? The coupon below will quickly bring you a copy of the Synthane Tubing Folder complete with tables of characteristics. Send for it today!

SYNTHANE CORPORATION, 8 RIVER ROAD, OAKS, PENNSYLVANIA

Please send me the Synthane Tubing Folder by return mail.

Name_____

Company_____

Title_____

Address_____

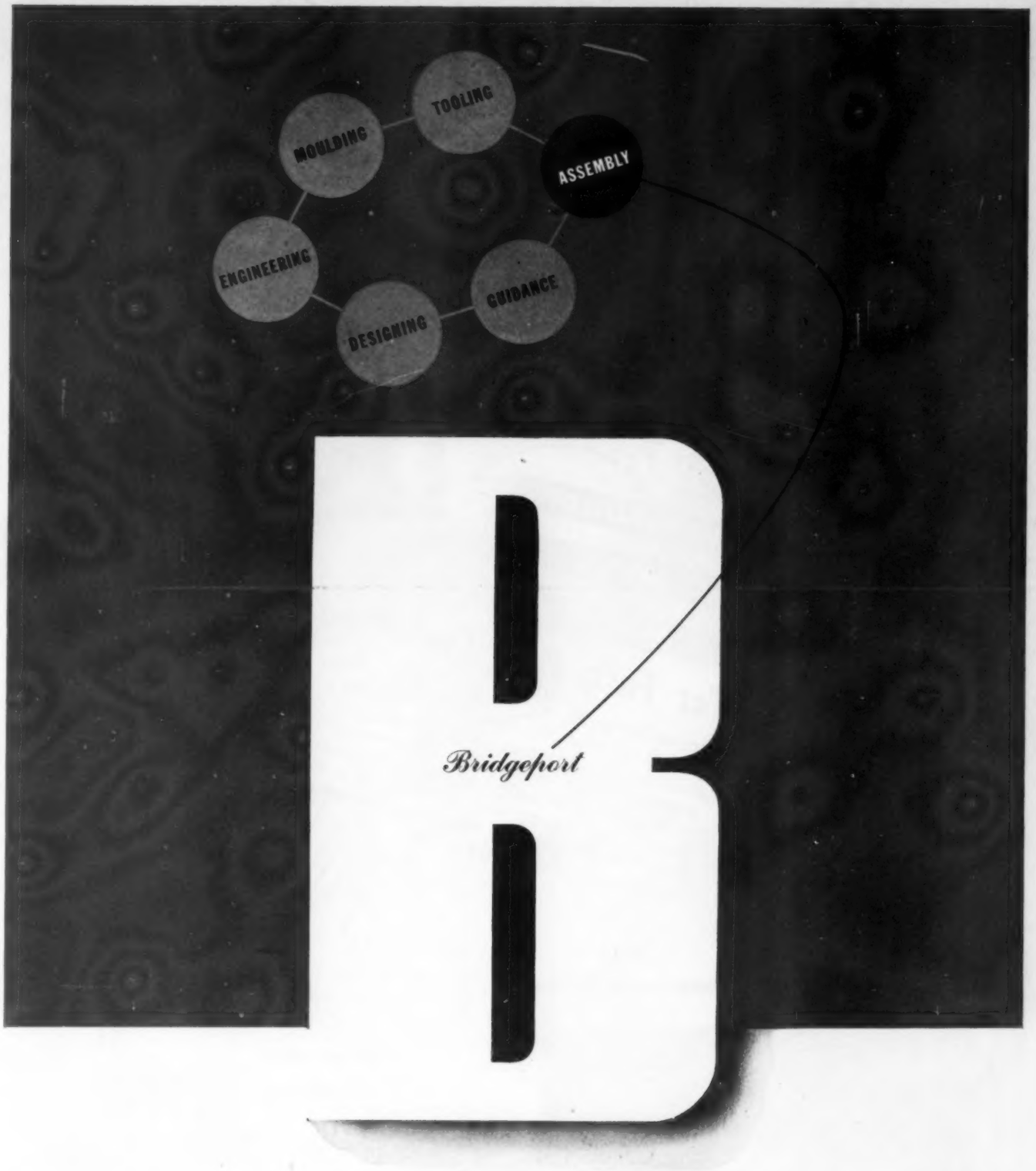
City_____ Zone_____ State_____

* *In addition to round tubes, Synthane produces a wide variety of irregular shapes by tube-making processes . . . . round with square or hexagonal centers, square, rectangular, channel, oval . . . and from a broad range of basic laminating materials—paper, fabric, asbestos, glass. The standard round tubing is always a little more economical to use, but if your needs call for an irregular shaped section, it will pay you to inquire about Synthane's diversified line of rods and tubes.*

SYNTHANE

SYNTHANE CORPORATION S OAKS, PENNSYLVANIA

Representatives in ALL Principal Cities



In addition to moulded plastics our metal division enables us to offer a complete assembly service which is adaptable to your specifications, resulting in greater convenience and economy for you. For plastics . . . think of Bridgeport.

BRIDGEPORT MOULDED PRODUCTS, INCORPORATED

BRIDGEPORT CONNECTICUT

EVEN AN *Alligator* HAS TO LOOK TWICE!

● Almost everyone stops for a second look at these smart, distinctive *Resproid* alligator grains for handbags, luggage and accessories. So natural looking they'd fool an alligator itself — they're a good example of the versatility and beauty of *Resproid*, a modern vinyl plastic that is making profits for manufacturers in many different fields.

Besides these reptile grains, *Resproid* is made in a wide variety of styles, colors and weights. Softly tinted, translucent plastic films that give new sales appeal to shower curtains, waterproof garments, aprons — patent and leather type finishes that make colorful handbags and luggage, and scores of other items.

Resproid's only limit is *your* own imagination.

And — don't think of *Resproid* as "just another plastic"! Made in a modern, fully equipped factory under strict laboratory control, *Resproid* is compounded of high molecular weight resins which can be processed only on the latest plastic equipment and which give greatly superior wearing qualities. Fully waterproof, *Resproid* resists cracking, fading, scuffing and abrasion — most acids, alkalies and oils.

Whether you're looking for new things to make, or new ways to improve your present lines, write for samples of *Resproid* today! No written description can tell you as much as this plastic itself.

Respro INC.

CRANSTON 10, RHODE ISLAND

THE CARVER LABORATORY PRESS

Standard for Research and Development

Year after year, the good will and good words of satisfied users account for more than half the sales of Carver Laboratory Presses. Such evidence of approval is the best indication of the essential value of this equipment.

A principal aid in plastics development is the Carver Laboratory Press. This small, powerful press is just what every laboratory needs for research and development work. Standard Accessories include Electric or Steam Hot Plates, Carver Test Cylinders, Swivel Bearing Plates, Cage Equipment, etc. This equipment has long been accepted as standard for making quick, accurate small-scale tests; for development, research and instruction work; testing single cavity molds; preparation of samples, and even for small scale production. Accurately controlled pressures to 20,000 lbs. Self-contained hydraulic unit, with 6" gauge rigidly mounted on base. Special gauges available for low pressure work. Write for catalog.

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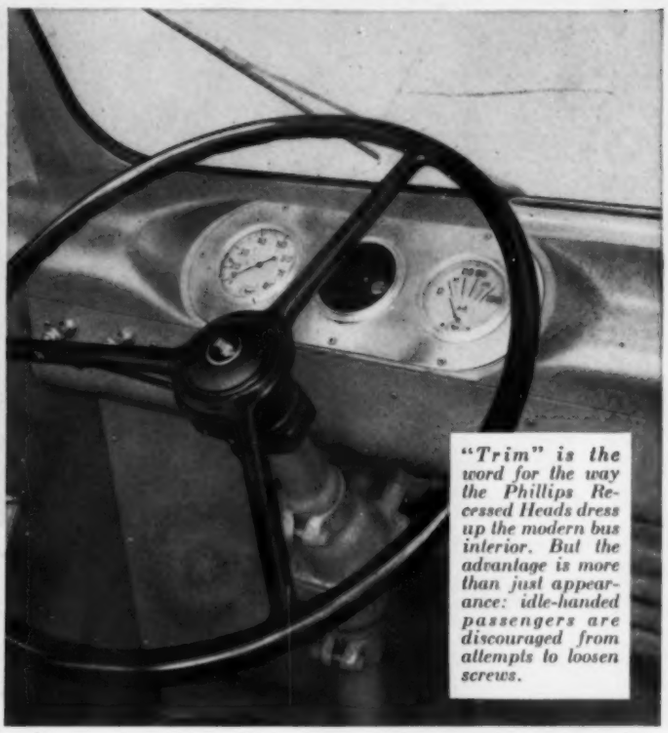
"Prevents costly interruptions of progressive assembly"

...says MACK Mfg. Corp.

Digest of James O. Peck Co. report, another of the independent studies of assembly savings made with Phillips Recessed Head Screws in leading plants.

Power drivers are "puncture-proof" despite the thin, sheet aluminum panels, because of the "engineered fit" of the Phillips Driver Bit in the Phillips Recess. No skids! No burred heads!



"Trim" is the word for the way the Phillips Recessed Heads dress up the modern bus interior. But the advantage is more than just appearance: idle-handed passengers are discouraged from attempts to loosen screws.

"Our engineering department specified Phillips Recessed Head Screws on both trucks and busses," explained the technical assistant to Mack's general superintendent. "Since we are turning out 1750 trucks and 200 busses a month, and each unit requires thousands of Phillips Screws, there are good reasons for this specification.

"STOP DRIVER SKIDS THAT STOPPED THE ASSEMBLY LINE. Phillips Screws ended the scratching and puncturing of aluminum panels by drivers skidding out of slotted screw heads. We save the time and labor of interrupting our progressive assembly to remove and replace panels. That was the big cost — many times the cost of the damaged panels themselves — and that's just one way Phillips Screws save us money.

"BETTER DRIVER CONTROL. The positive fit of the driver in the Phillips Recess makes it practicable for us to use air power tools and speed driving. Even when driving at an angle, we avoid slips. And, with a spiral driver, the operator is able to tighten a screw by 'feel' without danger of chewing up the head.

"CONTRIBUTES TO DESIGN OF BUS INTERIORS. Particularly when large screws are used, the Phillips Recessed Head adds ornamental design to the interior, while slotted heads, with the slots pointing every which way, detract from the trim appearance we aim for. Furthermore, it discourages passengers from attempting to loosen Phillips Screws as they often do slotted screws, with snagged clothing a result."

FOR IDEAS USEFUL IN YOUR ASSEMBLY, get this study of Mack Mfg. Corp. methods, and other assembly reports covering metal, wood, and plastic products. Mail this coupon NOW!

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Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

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Plastic BASIC BEADS

Teckna's specially designed machines produce balls, beads, handles, cylindrical shapes and parts for any application with the utmost precision.

Close tolerances are regular at Teckna. Turned rods, pulleys and all kinds of industrial parts made to precise specifications are readily produced in large quantities.

Pearl-like Loveliness Begins with a TECKNA PLASTIC BASE

thus America's manufacturers of the loveliest simulated pearls start with precision-made plastic bases produced by the Teckna Company. These bases are literally jewels by themselves — perfectly shaped, warm and lustrous in finish, with a surface smooth, satiny and ready to take and hold the skillfully applied pearlizing.

It is this precision and fine finish that contribute so much to the excellence of the finished product. And it is also the reason creators of fine necklaces and jewelry have turned to Teckna and made this Company the largest producer of these basic elements.

Teckna also produces beautifully fashioned plastic beads, white, colored, opaque, iridescent and translucent. Their warmth, lovely feel and obvious high quality are making them the choice of the most exacting manufacturing jewelers and others.

TECKNA

TECKNA COMPANY INC.

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NORTHERN B'LVD & 223rd ST., BAYSIDE - NEW YORK

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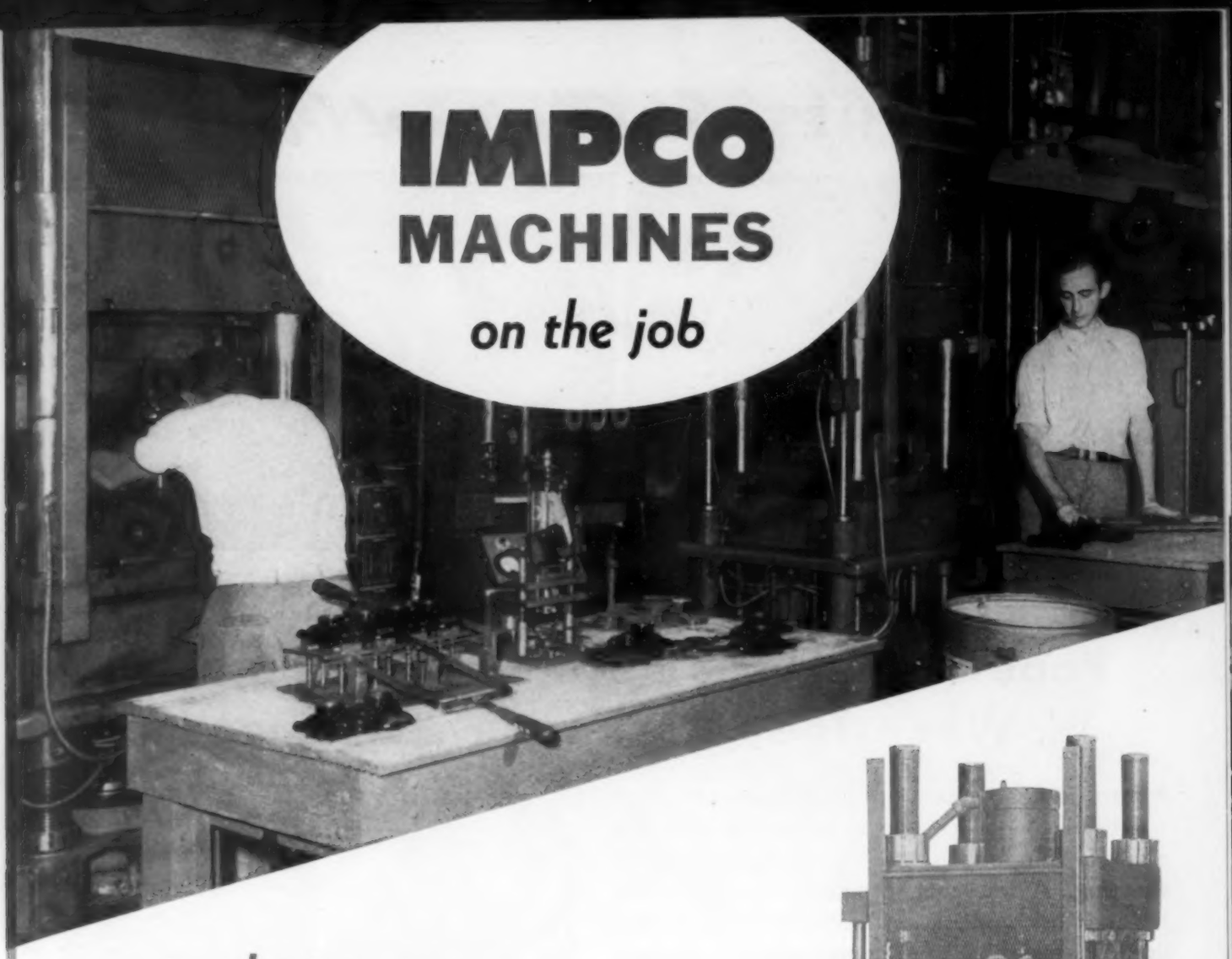
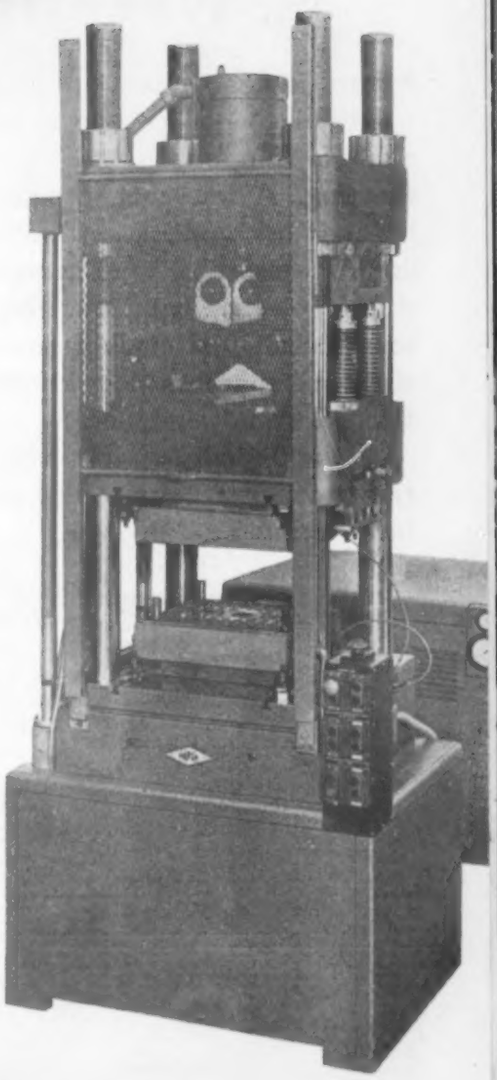
IMPCO MACHINES *on the job*



producing more . . . . .
earning more . . . for Consolidated



Here are 350-ton Impco plunger or transfer molding machines in operation at Consolidated Molded Products Corporation, Scranton, Pa.

Faster loading of pre-forms, faster cull removal and shorter plunger travel are possible with the Impco because the plunger or transfer cylinder is *beneath* the stationary platen.

Larger moldings without flashing ... reduced finishing costs ... better moldings are possible because the pressure ratio between the clamp and plunger cylinder is 7 to 1. Pressure on *both* cylinders can be adjusted for more efficient operation because they are powered by *separate pumps.*

This machine is also available in 50-ton capacity. *Why don't you* take advantage of these unique Impco features? Write for information or ask our representative to call.

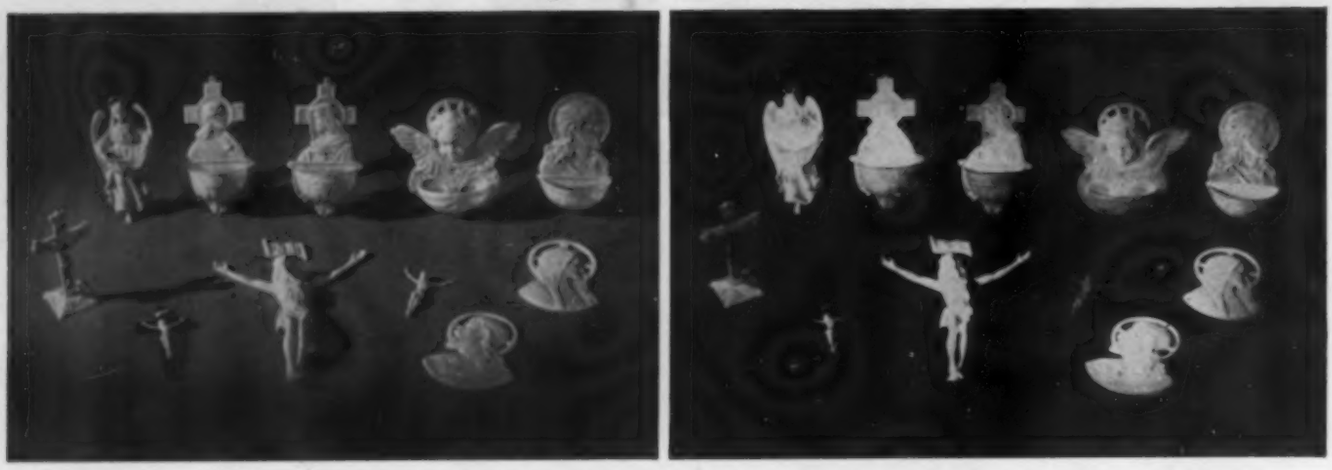
MP-9

Improved PLASTIC MOLDING MACHINERY DIVISION

PAPER MACHINERY CORPORATION

NASHUA, NEW HAMPSHIRE

WHERE THE *"Glow"* IS A *Natural!*



LUMINOUS properties are a natural for religious goods such as the items illustrated above, which were molded by Hartland Plastics, Inc., using phosphorescent cellulose acetate (Nixon Nitration Works).

Popular Products Become More Popular When They Are Made *Luminous*

THE increased interest in luminescent plastics is evidenced by the variety of products made of "luminous" plastic molding granules or sheeting. A few such products are illustrated here. Other applications include lamp shades and fixtures, table tops, switch plates and plate shields, electric light and door bell switch buttons, flashlights, clock cases and dials, safety signs and markers, door knobs and push plates, toys, gifts and novelties.

We will gladly discuss with you any application involving luminescent pigments that you have in mind.

A RULER that glows in the dark is made by Carbographic Studios of clear plastic with the markings silk screened on the reverse face, which is then backed up by (1) a phosphorescent paint and (2) an overall coat of non-luminescent white. Also available in 18" lengths.

DEE'S Glo-Ette Rattle amuses the baby day and night. Molded for Givens & Co. of phosphorescent polystyrene (Monsanto Chemical Co.) by Lakone Co.

Glowing advertising premiums, like this key chain tag, are excellent good will builders. Molded of phosphorescent polystyrene (Monsanto Chemical Co.) for the Supreme Novelty Co.

HORSE HEAD PRODUCTS
New Jersey ZINC

And on request we'll send you names of suppliers of luminescent molding granules or powders, cast or calendered films, laminating or tubing materials. (The New Jersey Zinc Company does not make plastics — we supply Horse Head* Luminescent Pigments to plastics manufacturers.)

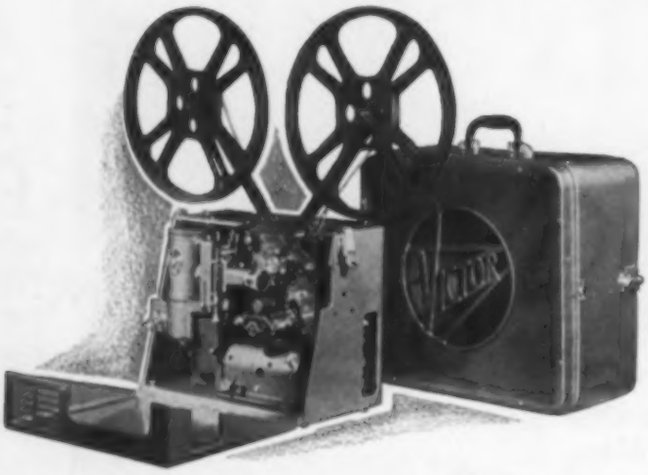
*Reg. U.S. Pat. Off.

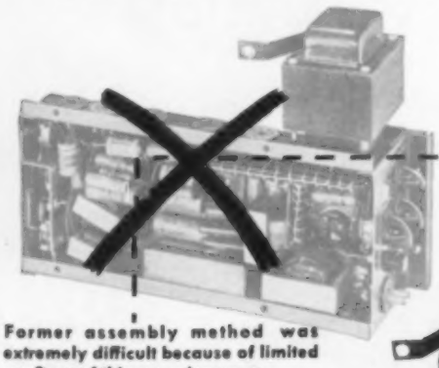
THE NEW JERSEY ZINC CO.
160 FRONT STREET • NEW YORK 7, N. Y.

It's* Horse Head* Luminescent Pigments *that MAKE these Plastics "Glow"

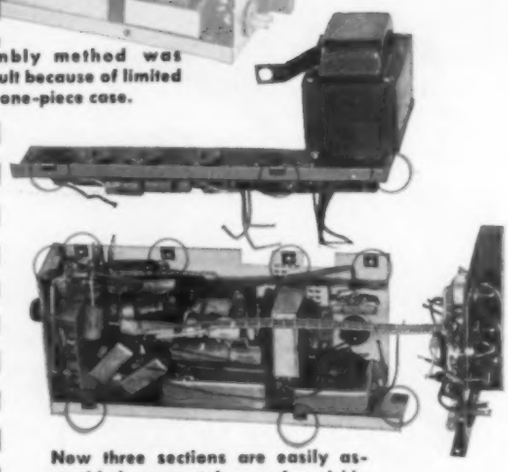
"WE DO FIND THAT WE HAVE REDUCED OUR ASSEMBLY COST APPROXIMATELY 36% ON THIS UNIT SINCE BEGINNING TO USE THE TINNERMAN SPEED NUT"

This is a direct quotation from a letter from A. S. Webeck, Works Manager of the Victor Animatograph Corporation, Davenport, Iowa, makers of 16 MM sound motion picture equipment.





Former assembly method was extremely difficult because of limited confines of this one-piece case.



Now three sections are easily assembled separately, and quickly fastened together with SPEED NUTS into completed unit.

SPEED NUTS always effect substantial savings in assembly cost, but here is a case of unusually high savings.

Victor Animatograph Corporation accepted our suggestions on the assembly of their amplifier unit. They discarded their time-consuming practice of assembling a myriad of small parts in a crowded case. Now the amplifier is assembled in three easy-to-get-at sections that are quickly fastened together with SPEED NUTS to complete the unit.

Assembler training time is cut from two months to a few hours. Assembly time is slashed, employee morale improved, and with three assembly lines instead of one, the risk of complete production stoppage due to shortage of one or two parts is avoided.

Let us demonstrate what SPEED NUTS can accomplish in improving the assembly of your product.

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In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London
In France: Aerocessoires Simmonds, S. A., Paris
In Australia: Simmonds Aerocessories, Pty. Ltd., Melbourne

Speed Nuts* PATENTED

*Trade Mark Reg. U. S. Pat. Off.

MORE THAN 4000 SHAPES AND SIZES

FASTEST THING IN FASTENINGS

Produced by Western Electric; parts molded by Berkeley Engineering, Erie Resistor Corporation and Watertown Mfg. Co

More than Meets the Ear

• The latest development in hearing aids shown above is a product of one of America's pioneers in this field. • These instruments are housed in cases of striking beauty, molded from one of the newer formulations of Chemaco Ethyl Cellulose, developed to produce a blemish-free, glossy surface. • As light as the proverbial feather, they nevertheless are dimensionally stable and amazingly resistant to impact. • Specified by Western Electric in two tones of neutral gray and in flesh, Chemaco Ethyl Cellulose is nevertheless available in an unlimited range of colors — transparents, translucents and opaques. • If you are seeking improved quality for mass production, let us show you how our new formulations of Ethyl Cellulose add that custom-made touch without boosting costs. Write today! • Chemaco Corporation, Berkeley Heights, N. J. Branch office in Cleveland.

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Also Manufacturers of Cellulose Acetate and Polystyrene

Which Material?

Plastics

or

Zinc Alloy?

What Method?

Injection

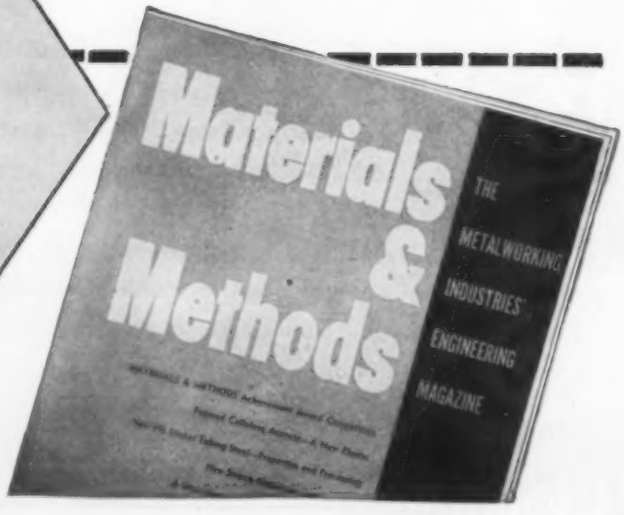
Molding

or

Die Casting?

The magazine edited for the men who decide

- *what material*
- *whose material*
- *what method*
- *whose equipment*



REINHOLD PUBLISHING CORP., 330 W. 42nd St., New York 18, N.Y.
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Advertising Managers for INDUSTRIAL & ENGINEERING CHEMISTRY • CHEMICAL & ENGINEERING NEWS

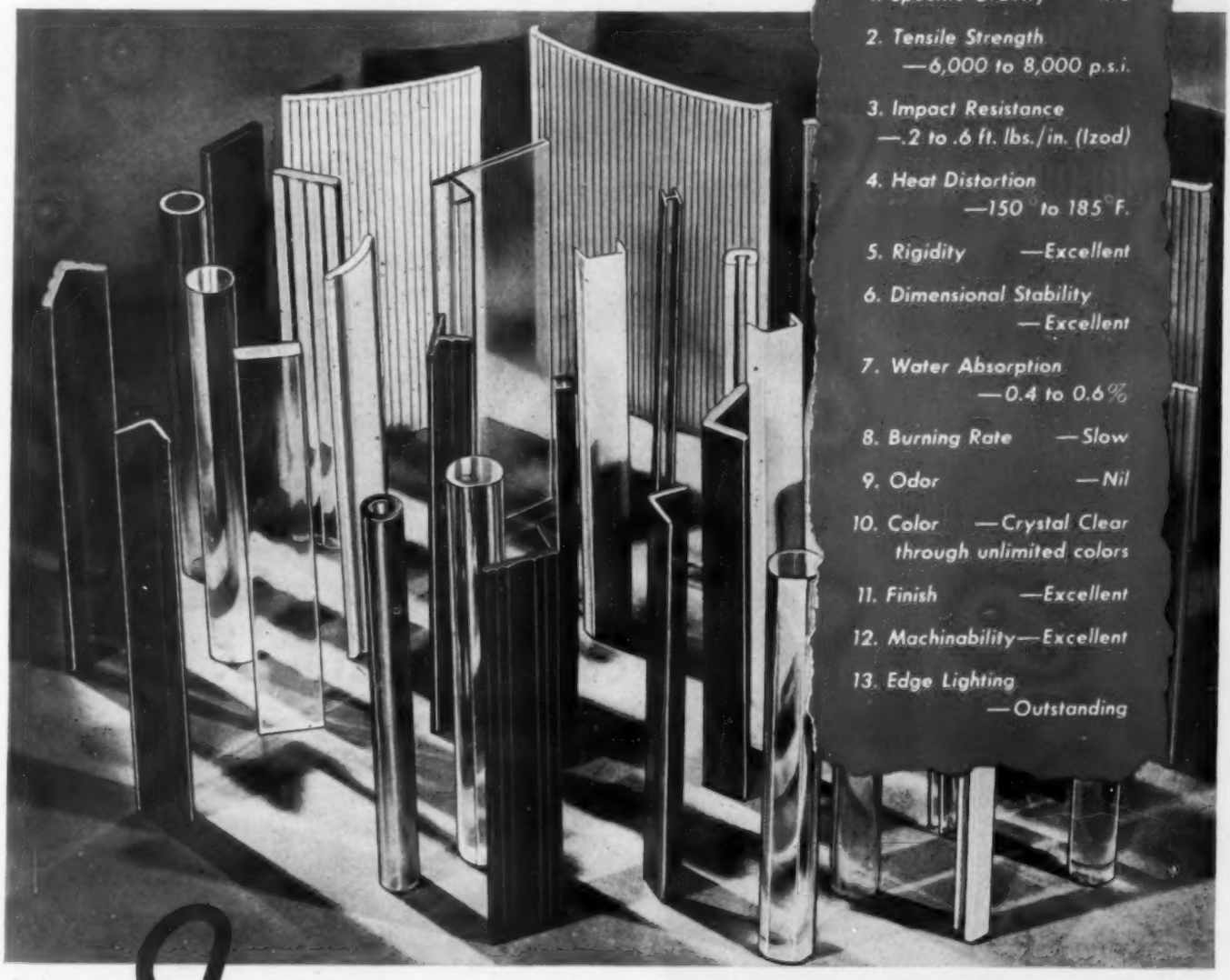
SANDEE EXTRUDED *METHYL METHACRYLATE* SECTIONS

METHYL methacrylate under the trade names *Plexiglas* and *Lucite* proved during the war that serviceability equalled its outstanding beauty. Sandee is happy to add *extruded acrylic sections* to its ever growing list of successful Sandee extrusions.

Now, simple and complex shapes in small and moderate sizes and in crystal clear, transparent or translucent color can be extruded to add all of the inherent beauty and serviceability of this material to your products. Rods and tubes in sizes under ½" diameter could also be extruded to meet your specifications. Study the excellent physical and chemical properties of this material, add its outstanding visual appeal, then call on Sandee for those long sought, specially designed sections.

PROPERTIES OF *Sandee* METHYL METHACRYLATE

1. Specific Gravity —1.18
2. Tensile Strength —6,000 to 8,000 p.s.i.
3. Impact Resistance —.2 to .6 ft. lbs./in. (Izod)
4. Heat Distortion —150° to 185° F.
5. Rigidity —Excellent
6. Dimensional Stability —Excellent
7. Water Absorption —0.4 to 0.6%
8. Burning Rate —Slow
9. Odor —Nil
10. Color —Crystal Clear through unlimited colors
11. Finish —Excellent
12. Machinability—Excellent
13. Edge Lighting —Outstanding



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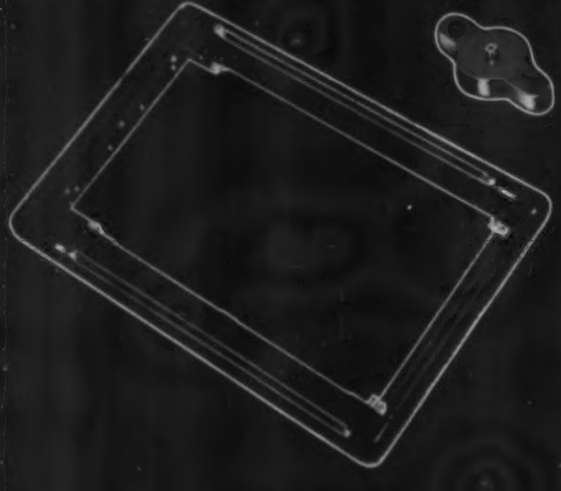
- ★ EXTRA SAFETY CONTROLS:
  Provide protection for the operator
  Prevent damage to mold and press

Standard models available from 50 tons to 300 tons capacity. Ask for Bulletin 251.

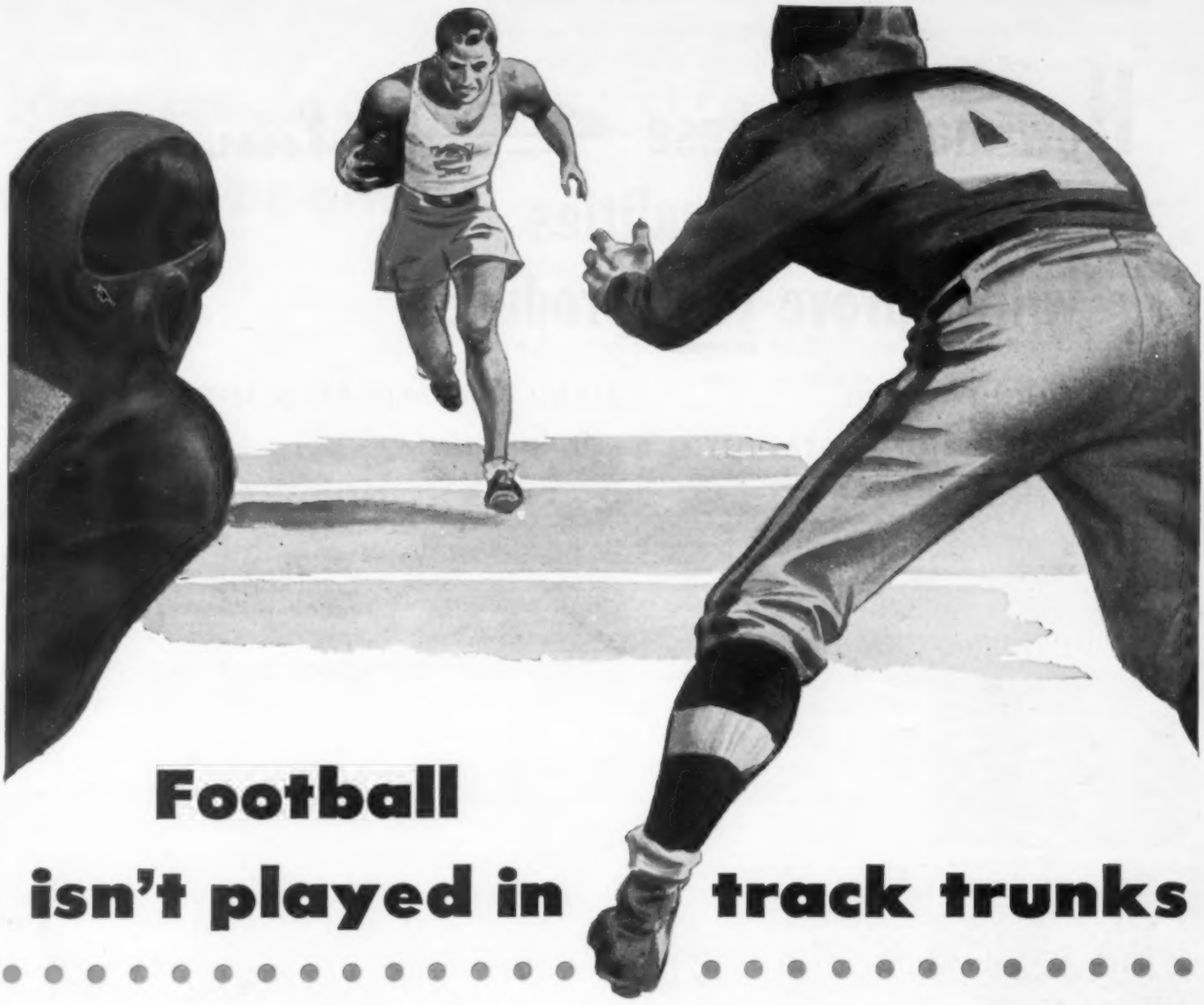


Ask for NEW Bulletin 251

BALDWIN

HYDRAULIC MOLDING PRESSES

The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A.
Offices: Philadelphia, New York, Boston, St. Louis, Chicago, Birmingham, Houston, Cleveland, Detroit, San Francisco, Washington, Seattle, Pittsburgh.



Football isn't played in track trunks

Clad in track suit, what chance would a player have against a team equipped with the "armored" togs of football!

In many phases of production involving paper . . . essential industrial papers, that is . . . it also becomes vital to provide proper physical and chemical characteristics to withstand "unnecessary roughing". Modern MOSINEE papers for the plastics industry, for instance, are engineered specifically for plastics requirements. For the electrical industry and other mechanical applications, MOSINEE paper characteristics are provided for maximum arc resistance, high dielectric strength, low moisture absorption, high strength-weight ratio. For other products and processes, MOSINEE creates special stretching papers, high tensile, high fold and tear resistance, high absorption or moisture repellency papers . . . controlled maximum-minimum pH, and other scientifically created papers . . . dependable in uniformity and performance.

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MOSINEE PAPER MILLS COMPANY

MOSINEE • WISCONSIN

Essential Paper Makers

Please address your letter "Attention Dept. A"

How many of these Duplan Glass Fabric qualities will improve your product?

1 LIGHT WEIGHT
2 DIMENSIONAL STABILITY
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5 ALKALI AND ACID RESISTANT
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AUTOMOTIVE INDUSTRY reduces gasket blow-outs with Glass Fabric reinforcement and resistance to heat, moisture and oils. Provides lightness and shock resistance for trailer fenders and trunk lids.

ELECTRICAL MOTORS, Generators and Transformers are lighter, more compact with Glass Fabric insulation. Tapes for coils and wiring resist high temperatures, overloads and moisture penetration...unaffected by oil and most acids... cannot rot.

LOW COMPRESSION MOLDS and Dies are reinforced with Glass Fabric for sturdiness and dimensional stability... result in considerably reduced tooling costs in drilling jigs, and checking and assembly fixtures.

GLASS FABRIC LAMINATES add impact strength and low moisture absorption to all types of industrial parts: aircraft defroster ducts, tail cone assemblies and other aircraft parts.

The complete range of Glass Fabric's applications has not been fully explored...won't be until you have considered this multi-purpose raw material in your product design.

Glass Fabrics may speed your production...reduce your shipping weight...improve your product's appearance and user's satisfaction. Convince yourself by consulting our technical staff.

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WRITE: DUPLAN weaves many standard Glass Fabrics...a list and helpful technical data will be forwarded to you on request. DUPLAN will work with you to develop special weaves for specific uses.

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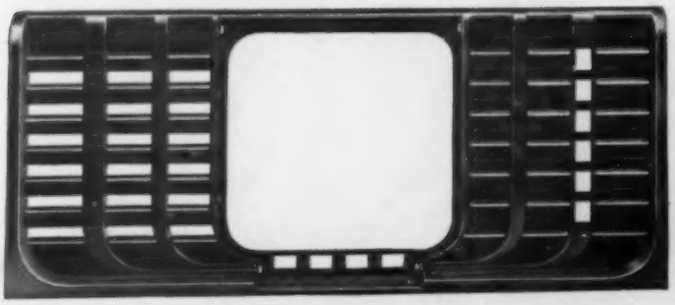
"on the beam"

WE OPERATE on a very high frequency of plastics molding assignments from manufacturers in the radio and electronics field. Their confidence in our ability to best serve them in this specialized field is expressed in two ways . . . our large number of repeat assignments . . . the variety of these assignments.

This grille, molded for the new Zenith Trans-Oceanic portable radio, is an excellent example of our injection molding skill in the radio field. Its molding demanded tolerances requiring "on the beam" exactness.

Elmer E. Mills Corporation engineers will treat your particular plastics molding problem with similar "on the beam" exactness.

Your finished product will be both a source of pride and profit to you. Investigate our injection molding and extrusion services today.



Grille, Molded for the New Zenith "Trans-Oceanic" Portable Radio.

Write on your letterhead for the new Injection Molded and Extruded Plastics catalogue. Or, for detailed information about MILLS PLASTIC* pipe, tubing and fittings, write for circulars containing data and illustrations.

*Trademark Reg.

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INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Plexiglas, Nylon, Polystyrene, Styron, Lustron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Cerex, Fortiçel, MILLS PLASTIC*, Saran, and other Thermoplastic Materials.

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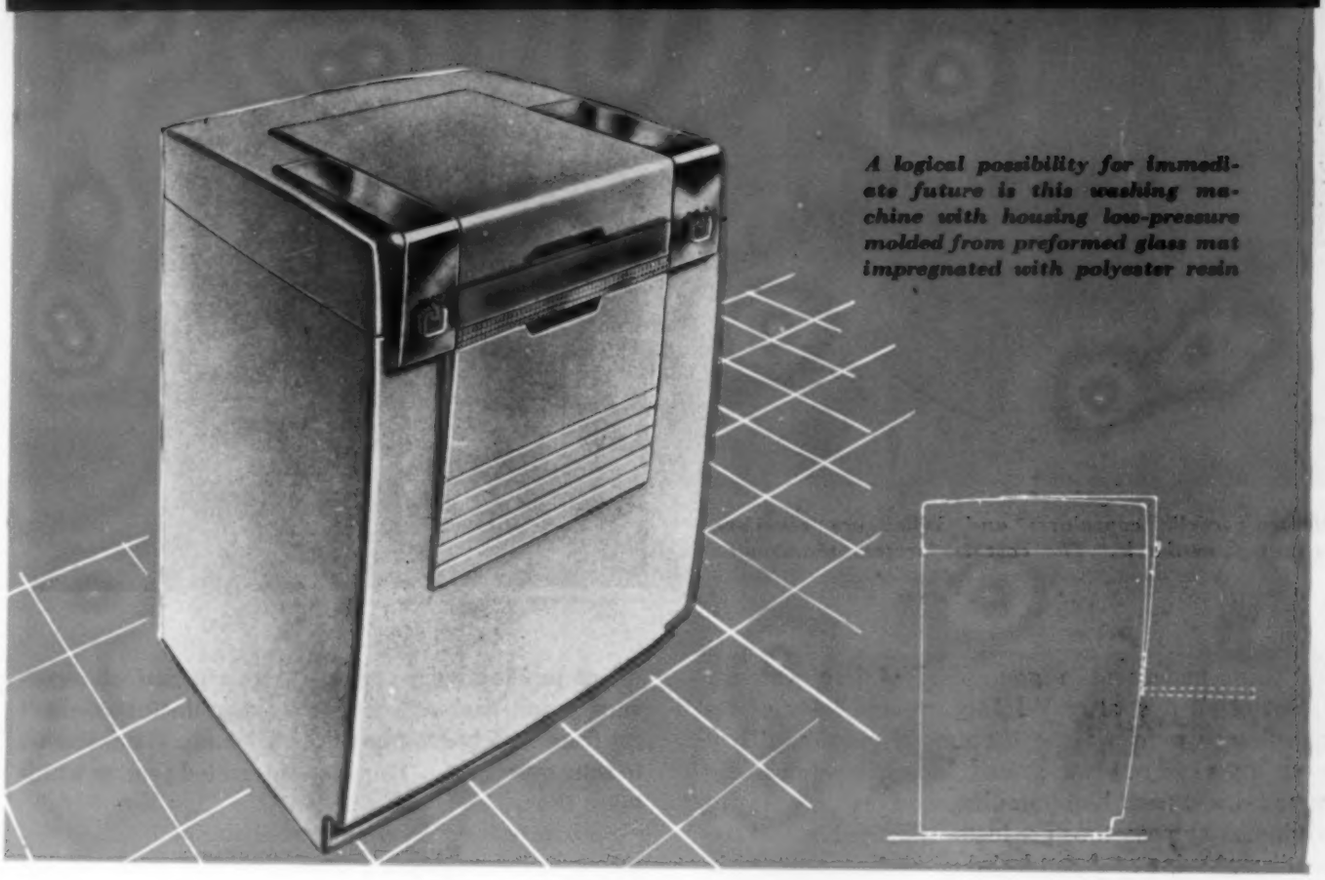
MODERN PLASTICS
VOLUME 25 NOVEMBER 1947 NUMBER 3



A logical possibility for immediate future is this washing machine with housing low-pressure molded from preformed glass mat impregnated with polyester resin

More products in plastics are here and to come, say designers

IT IS NOT simply a coincidence that the development of industrial design as a profession has paralleled the growth of plastics as an industry. Plastics gave designers a whole new range of materials which could be used in mass production. Every new plastic broadens their scope.

Thus, from 1930, when there were not more than a dozen industrial designers in the United States, to V-J Day, when more than 120 designers were actively at work, the plastics industry grew correspondingly. During the war years, these designers concentrated on creating more efficient products for war use, regardless of cost; today they have to consider utility and beauty as well as practical costs.

Among those pre-war designers who realized the importance of plastics to their field there were several whose work, along with sketches to illustrate their predictions, was described in MODERN PLASTICS. Professionally designed products won many awards in MODERN PLASTICS Competitions in those years. Not a few of those predictions came to production; not a few of those pre-war products are still selling.

Design of new consumer goods practically stopped early in 1941, because most designers were at work on projects for the armed forces even before war was declared. As their work went on during the years of turmoil, "new" plastics, such as polystyrene, the vinyls, the polyesters, and others came into sufficient production to permit volume wartime uses. At the same time, all plastic materials and processing methods

Molded acrylic containers and ladles are seamless, acidproof, washable. The cost is far less than metal

PHOTOS, COURTESY NATIONAL DAIRY PRODUCTS CORP.

for them underwent a great deal of improvement.

Out of all this, after V-J Day, came a body of designers who were wiser in the uses of plastics. They were eager to put war-gained knowledge (including some learned from both our allies and our enemies) to work making peacetime products. The public and the retailers, having read and heard of wartime progress in plastics, demanded immediate translation of this progress into post-war "miracle" products.

What designers want in plastics

Standardized trade names, formulas, and numbers, so that plastics can be used with the same simplicity found in S.A.E. standardizations.

More use of various plastics in combination, for contrast between clear and cloudy, between translucent and opaque.

Less brittleness and an increase in structural strength in thin walls. Parts that can stand a metallic look and feel can be reinforced with plating, but where they can't, stronger plastics or other means of reinforcing thin parts are needed.

Light cross-sections plus toughness and rigidity of form. Materials which will permit increase in the range of sizes of objects that can be designed in plastics.

An economical method of producing experimental prototypes in the same material as will be used in commercial production.

But product ideas, especially in a period of reconversion and back-order filling by manufacturers, don't get from sketches to blueprints to plants to production to sales overnight. This is an integrated process which takes time.

Evaluating progress

Now, after more than two years of peace, it is possible to evaluate post-war progress in the application of plastics by industrial designers, to get positive comment from designers on their experiences with plastics and with the plastics industry, and to learn their firm intentions towards plastics in future proposed applications.

MODERN PLASTICS, in preparing this study, naturally could not cover the recent work done by all of the designers working with plastics. Neither time nor space permitted. Ten designers were selected, seven being heads of long established concerns and three newcomers. Their work represents a good cross-section of the best designing being done in plastics today.

Every designer contacted is specifying more plastics and more kinds of plastics today than before the war. As J. Gordon Lippincott comments: "The broader application of plastics has given the designer new impetus in creating for mass production. New subtleties of compound curvature, greater simplicity in production, a wider range of color, an increased use of molded forms which previously had to be assembled, have become available to the designer. In short, plastics are wonderfully adaptable to what we call integration of design elements."

None of the designers have any prejudice towards any one plastic because the range of materials allows them wide selection for any given application, and a

PHOTOS, COURTESY CELANESE CORP. OF AMERICA

Acetate sheets and rayon fabric are laminated to produce the rigid sheets out of which this luggage is formed. Hangers, handles, and "feet" are molded acetate. Snap-on rayon liners go into the bags

price range in balance with required properties. Some of their criticisms and future requirements are given in the lower left corner of the opposite page.

Electric iron features

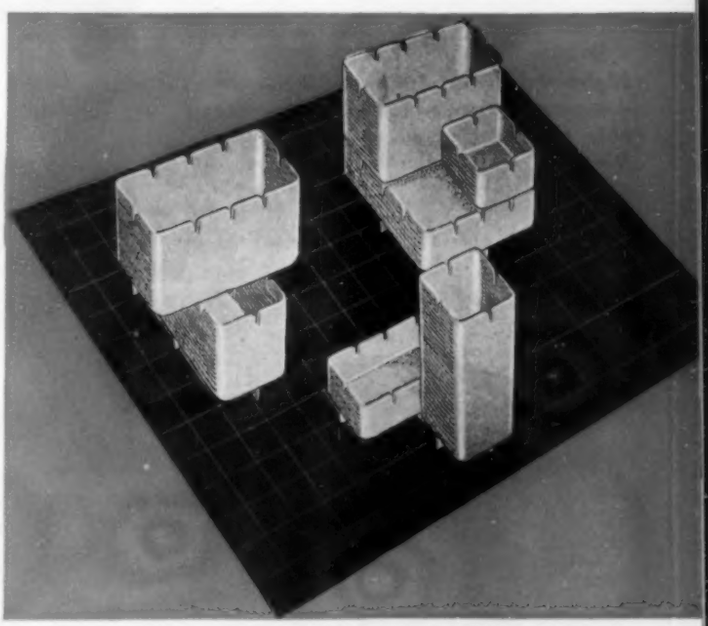
From an imposing list of new products designed with plastics since the war, Henry Dreyfuss selected the Hoover Automatic Electric Iron made by the Hoover Co., North Canton, Ohio. The design was based on a survey made to determine what women want and don't want in an iron.

Two of the features asked for were extra insulation to protect the hand from the iron's heat, and a design which would cut down the danger of accidentally touching the hot metal with the fingers while ironing. Directly beneath the handle of the Hoover iron is a large pancake-shaped dial, which serves both as the temperature control and as added protection against the heat of the iron. This dial fits flush with the widely flared handle legs, covering the whole top of the iron. For still further insulation there is an air space between the plastic top and the metal base of the iron. Both the dial and the handle are made of brown phenolic. The handle is shaped to fit the hand and the wide back of the handle provides extra hand support, with the thumb rest molded in.

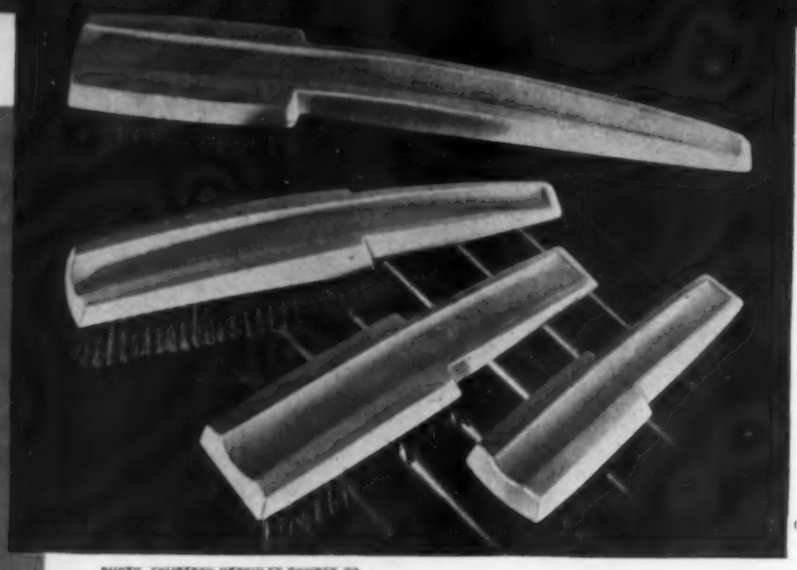
Functional brushes

The Fuller Brush Co. selected J. Gordon Lippincott & Co. to redesign its entire line of personal brushes. Ease of fabrication, functional superiority, and consumer acceptance were points stressed by the makers.

Unlike wood, plastics presented no troublesome problems of wood grains and water absorption. By specifying plastics, the design created could be faithfully reproduced by the injection molding process



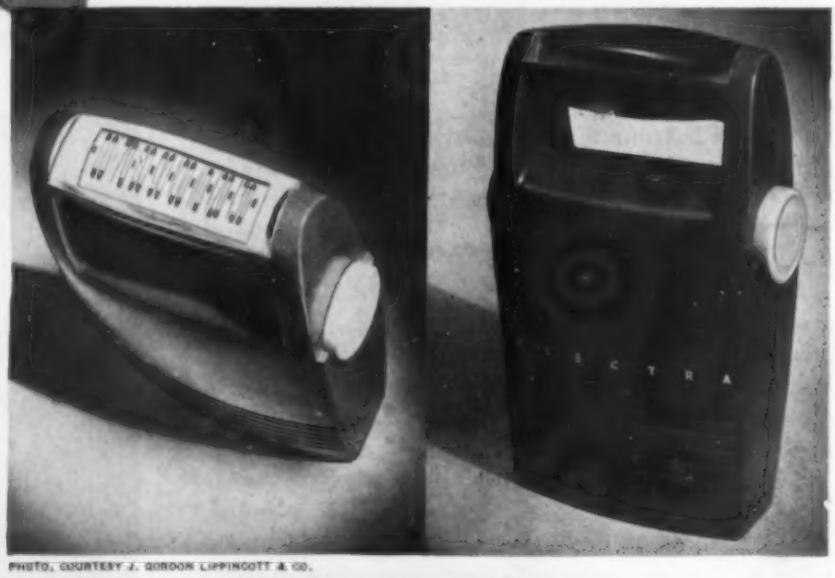
Above—Nesting flower vases could be molded of polystyrene. Below—Phenolic iron handle and heat control prevent user from touching hot iron accidentally. Air space between handle and iron increases insulation



PHOTO, COURTESY HERCULES POWDER CO.

Above and left—Brush handles are molded of cellulose acetate. Thick cross-section gives them "value" feel. Groove in center reduces apparent weight, allows for better grip

Right—Portable radio (still only a designer's idea) would have comfortable grip molded in as part of body. Dial and control knobs would be out of the way, yet easily accessible



PHOTO, COURTESY J. GORDON LIPPINCOTT & CO.

Urea handle of coffee maker is curved on one side, flat on the other. To lower mold costs, cover and holder for upper bowl are molded in one die with changeable inserts

and would require the least finishing. Flaws in appearance could be obviated from the start, and uniformity was obtainable because the brushes were designed with cross-sections sufficiently thick to be molded to close dimensions. From the consumer's point of view, plastics are pleasant to see and feel.

Chemaco and Lumarith cellulose acetate are used for the brushes. Its tough, shatter-resistant nature made possible high-speed drilling of holes and stapling of bristles. The particular material specified resists the action of soap, hot water, and toilet preparations.

The single stumbling block to using plastics for these brushes was lightness of weight. Some articles, such as silverware, are regarded as more valuable if they feel heavier than they look. This is also true of brushes.

Heavy in weight, not appearance

To overcome this one negative factor a substantial quantity of material was used in the molding. The cross-sections are exceptionally heavy, which gives the weight necessary for the "value" feel. Then, after achieving the necessary weight, the next task was to reduce the appearance of bulk.

Visually, the design was conceived as a series of fast sweeps, which break up the surface and eliminate visual heaviness. A groove running the entire length of the brush back also lightens the apparent bulk. The way the handle tapers from a thick central section to narrowness at the end is unorthodox in brushmaking. Usually a brush handle is narrow at the center, widening at the end. For an axe or hammer, where the end of the handle is broad to keep the hand from slipping when the axe is in motion, this is functionally good. But with hair, clothes, bath, and other personal brushes when the bristles are touching the surface to be brushed, the pressure is exerted into the bristle block. Thickness and mass then logically belong at the place where pressure is maintained.

The groove on the back of the brush provides a natural bracing point for the forefinger. Instead of motion coming from the wrist, at an angle to the arm, the new design makes the brush and the hand and arm of the user a single "unit."

The line of the bristle overhand was a design element developed in keeping with production requirements, as it is the point for the sprue of the mold. The sharp taper from face to back also had value in the bristling process.

Coffee maker

The new Firestone Vacuum Coffee Maker is the most recent plastic design job from the offices of Peter Muller-Munk Associates. Design requirements included a simple glass shape for automatic machine production, and a side pouring handle. This handle was developed around an entirely functional line to fit the hand and resulted in a non-symmetrical design in which the back side curves to fit the palm, with the other side flat for leverage and adequate thumb rest.

The handle is held in place by a stainless steel band, recessed into the handle, which offers a shoulder to provide rigidity when lifting and pouring. The neckband is made in two halves with a groove for the stainless band, and the plastic halves act both as a design element and as insulators.

Need for insulation and heat deflection was again

To improve appearance of electric guitar (left), the designer changed shape and added plastics. Access plate (above) is of a high pressure laminate. Head cover, fret bar, and control knobs are all acrylic

considered in the design of the electric stove base. No heat is directly transferred to the table top, and the projected flange of the base makes it possible to lift the stove easily.

The upper bowl cover and the bowl holder base are made from the same mold with changeable inserts making a solid section for the upper bowl cover or a threaded hole for the tube in the bowl holder. Substantial savings in the mold costs and unity of design were thus achieved.

Melmac melamine formaldehyde material was used in the stove base, Plaskon urea in all other parts. Molding was done by Hartford Products Corp., Hartford, Conn.

From ice cream to washing machine

Gerald Stahl, young newcomer who heads an all-veteran concern, designed an ice cream merchandising unit for National Dairy Products Corp. The unit comprises a facade which includes a rear-lighted acrylic sign and acrylic view windows for cup and cone dispensers, a counter, and a set of syrup containers and syrup ladles in a dipping well arrangement at the side. It turns a standard ice cream cabinet into a sundae bar at slight cost.

For the syrup containers and spoons a high-temperature Lucite was used: Sealtest red for the bowls, gray for the ladles. These parts are injection molded by Recto Molded Products Inc., Cincinnati, Ohio. The acrylic was selected because of color quality, and because the bowls must be seamless, impervious to all food acids, and cleanable with 180° water plus a non-abrasive detergent.

The plastic met all these demands at a unit cost of 70 cents per bowl as compared to $7.50 each for deep drawn metal. Unit cost for the ladles was 18 cents as against 53 cents in metal.

Stahl's projected plastic washing machine housing is designed to be low pressure molded in metal dies from preformed glass mat impregnated with polyester resin. It is in two simple sections: a shell and an inside tub, for ease of assembly, maintenance, and repair. For escutcheon and control knobs polystyrene is recommended, with lettering molded in from the rear and color wiped in for three-dimensional effect. Utility features incorporate loading from the top and a drop-down shelf for resting a laundry basket. Stahl is convinced that the low pressure materials and the preform method, reported to be nearing production stage, will be more economical than drawn and enamelled metal. Size and contours of the piece will be unlimited. Rustless and damage-proof surfaces will be combined in a material which is light and strong.

Luggage . . . flower vases

Morris Sanders, one of the designers who first recommended plastics to clients, offers as his most recent project a line of luggage made by Ray M. Whyte Co., Detroit, Mich., and developed by that company in collaboration with research engineers of the Celanese Corp. of America.

In making this luggage, sheets of Lumarith cellulose acetate and sheets of rayon fabric are laminated under heat and pressure to produce a strong, rigid sheet which is post-formed under further heat and pressure in a drawing die. In drawing, extreme care is taken not to distort the fabric weave or wrinkle the laminate.

The edge frame with piano-type hinge and other hardware are gold-colored anodized aluminum. Handles and "feet" are molded of Lumarith by Wolverine Plastics, Inc., Milan, Mich. Interiors of the bags are lined with snap-on Celanese rayon liners. Hangers of Lumarith are molded by Detroit Macoid Corp., Detroit, Mich.

Serving set in red and white polystyrene includes tray, two sets of salt and pepper shakers, creamer, and sugar bowl

Clean, easy-to-use shoe polish applicator-package would take cylinder-type reloads

Right—The use of plastic materials in this vaporizer gives it a streamlined appearance and makes it easy to clean. User can move vaporizer while it is in use without burning his hand

PHOTOS, COURTESY DEVILBISS CO.

Below—One designer's idea of the chair of the future is this one of low-pressure molded plywood with foam rubber seat and inside arms covered with fabric woven of vinylidene chloride

PHOTO, COURTESY SUNDBERG-FERAR

Above—Old coffee scoop (top) has been lengthened and streamlined. New model (bottom) looks better, easily reaches bottom of deep bag or can

Left and below—Ivory polystyrene gift box holds four "flat fifties" and 10 packs of cigarettes

PHOTOS, COURTESY PHILIP MORRIS & CO., LTD.

A flexible set of nesting flower vases, that can be used in combination or alone, is Sander's projection. They could be molded of polystyrene. Always market-wise, Sanders points out that a few million members of garden clubs throughout the country will welcome such a set for floral arrangements.

Guitars and serving sets

Barnes & Reinecke, Inc., designed the new Ultratone electrically amplified guitar for Gibson, Inc., Kalamazoo, Mich. Through electrical pickup, controlled in volume and tone, this instrument can imitate the harp, organ, and other musical instruments, as well as the human voice.

The main body is formed of maple, finished in gleaming white lacquer. The access plate on the base is of black paper-based high pressure laminate. The head cover, fret bar, control knobs, and handles are made of molded acrylic. The peg buttons on the tuning keys are injection molded of coral cellulose acetate. Plastics were selected because of their versatility, light weight, and color range. Fret markings are color filled from the reverse side and add to the abstract quality of the overall design. The combination of plastic, wood, and steel was used to make the guitar a show piece in its sales appeal and to give it improved tonal quality.

Another recent Barnes & Reinecke design job is the Hostesset, molded and sold by Federal Tool Corp., Chicago, Ill. It consists of a creamer and sugar bowl and two sets of salt and pepper shakers on a tray, in a color combination of red and white.

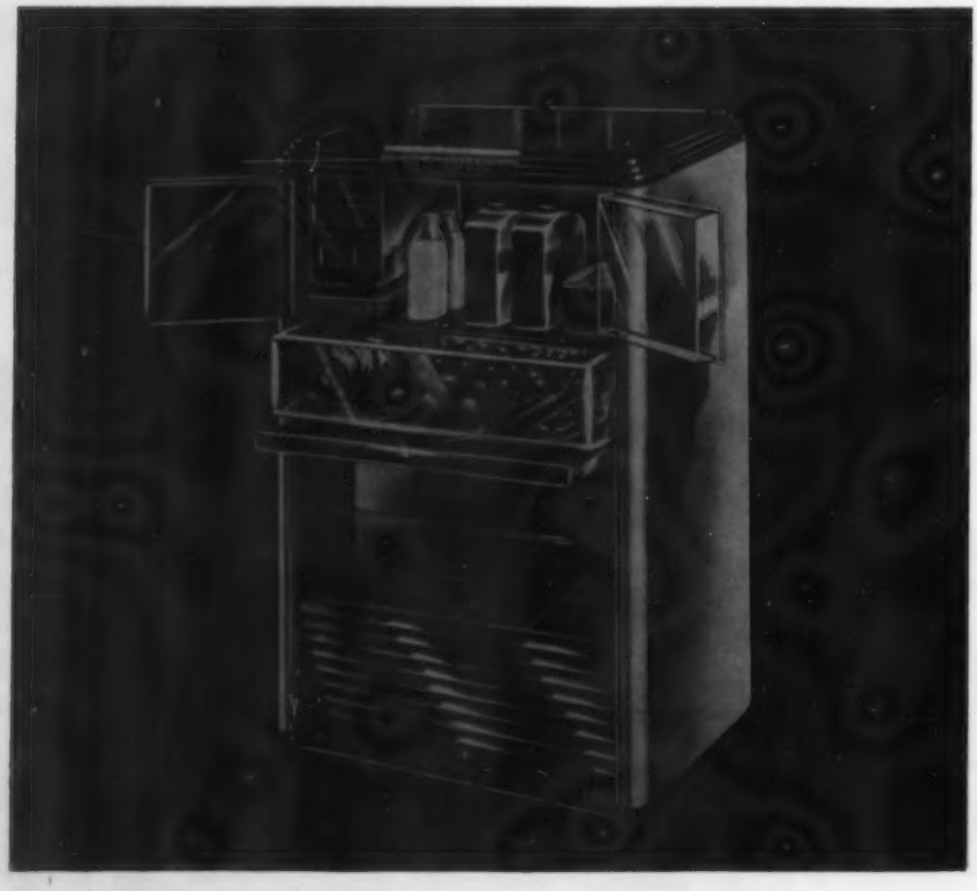
The problem here was to create a quality appearance in a low-cost molded item. A rounded square shape was chosen and walls were thickened to elimate internal strain. Lustrex heat-resistant polystyrene is the material used.

Vaporizers to plywood chairs

Engineers of the DeVilbiss Co., Toledo 1, Ohio, worked with Sundberg-Ferar in the development of the DeVilbiss Vaporizer. It is not strictly a post-war item, being redesigned from a model which was first introduced in 1943.

The function of this vaporizer is to effectively spray medicated vapor into a room without throwing drops, and the problem was to design a streamlined, easy-to-clean double walled container that could be moved from place to place while in operation without burning one's hand or creating a fire hazard.

Plastics were chosen over metal because they answered the problems of appearance, assembly, and insulation and could be molded to extreme accuracy of dimension for dis-assembly in use. The plastic for the water container and cover had to be a type that would withstand heat and moisture on one side only. Even some plastics that would withstand boiling were found unsuitable. The phenolic materials selected take exposure to steam for hours at a time and withstand various medicaments (*Please turn to page 198*)



Designer's refrigerator has plastic drawers instead of usual doors, except for top compartment. Foot pedals open drawers separately and switch light on or off

Announcing

MODERN PLASTICS COMPETITION

for 1948

THE PUBLISHERS take pleasure in announcing that the Modern Plastics Competition, not held since 1941, will be resumed in 1948. This competition will again be an event of major importance to all people interested in plastics, their best applications, and their proper merchandising.

★ Full details will be presented in the February 1948 issue.

★ Entries will be accepted during February, March, April, and May, 1948.

★ Prize winners will be announced in the September 1948 issue.

★ Winning entries will be placed on display in New York in September, simultaneously with the National Plastics Exposition at Grand Central Palace.

★ Following the competition and exhibit in New York, travelling exhibits will circulate throughout the United States and abroad.

★ Publicity will be maintained before, during, and after the competition and, as in the past, will be organized to blanket the press.

Resin laminates

Melamine resin laminates in solid colors and specially designed inlays are used for the bar top, table tops, and wall areas of this buffet-lounge car. Forward part of car (shown above) is arranged for serving sandwiches, soft drinks, and light meals. Galley and bar are in center section (beyond waiters in above picture) and lounge area takes up rear of car. Unusual seating arrangement and subdued lighting lend an atmosphere of informality

on the rails

by PRESCOTT FULLER*

Beauty, ease of maintenance, and long life of melamine resin laminates led to their use in new train

THE CHICAGO, Milwaukee, St. Paul and Pacific, more familiarly known as the Milwaukee Road, is one of the few railroads in the country which designs and builds its own equipment, for both freight and passenger use. The latest product of the road's car-building shops is the Olympian Hiawatha which is, in reality, six new trains—identical in design and appointments—which provide daily service between Chicago and Tacoma.

In these new trains, the Milwaukee Road has made extensive use of Formica, a Melmac resin laminate, manufactured by the Formica Insulation Co., 4614 Spring Grove Ave., Cincinnati 32, Ohio.

Beauty combined with strength

The Olympian Hiawatha consists of a 6000 horsepower Fairbanks-Morse three-unit Diesel electric locomotive, a mail and express car, a combination express and dormitory car (for the crew), three coaches, two Touralux sleepers, one combination coach and sleeper, one diner, one buffet-lounge car, and two cars offering compartment or roomette accommodations.

The 15-car Olympian Hiawatha weighs only as much as a conventional 14-car train on any other railroad. Each car surpasses the standards for strength set by the American Association of Railroads specifications, and yet is much lighter in weight.

When plans for the Olympian Hiawatha were begun, it was decided that although a passenger train must conform to certain definite mechanical specifications, beauty, comfort, and convenience should not be sacrificed in any way. Consequently, Brooks Stevens, industrial designer, was retained to supervise its design from one end to the other.

Coaches and sleepers

Interior decoration is based on two-tone color schemes, consisting of a dark and light color distributed for ease of maintenance and minimum soiling. The interior coach walls are panelled with gray-green and simulated wood Formica panels which blend well with the walnut veneers around windows and the walnut bulkheads at the ends of the cars. Soft gray-green and ivory Formica panelling makes up the walls of the women's lounge, and French costume prints on

* Plastics Div., American Cyanamid Co., 30 Rockefeller Plaza, New York City 20.

Linen finish panels are used for wainscoting in sleeping cars. Berth bottoms are gray-green and vestibule walls are walnut-colored panels

Melamine resin laminate on center section wall of this diner has inlaid falling leaf pattern on pale green background. Angular arrangement of tables makes diner look roomier and less formal

one wall and floral prints on the other are permanently inlaid in the plastic panelling. In the new Touralux sleeper, wainscoting, vestibule walls, and berth bottoms are surfaced with linen finish, walnut, and gray-green Formica panels, respectively.

Buffet-lounge and diner

Soft lighting and novel seating arrangements create an atmosphere of informality in the buffet-lounge car.

Pastel blue panels with delicate French floral prints inlaid are used on this wall of the women's lounge

The forward half of the car is arranged for serving sandwiches, soft drinks, and light meals. The galley and bar are located in the central section and the regulation lounge area is in the rear half of the car. Bar top, table tops, and seat backs are panelled with mar-resistant Formica in both solid colors and specially designed inlays. Soft, gray-green Formica is used for the entire wall area.

The car immediately following the buffet-lounge car is a full diner, featuring a semi-diagonal seating arrangement. In the central area Formica panelling with a gray-green background is employed. This is relieved by a random pattern of falling leaves which has been inlaid in the plastic panel. Table tops and vestibule walls are covered with the same material.

Reasons for choice of laminate

Although Melmac laminates have been used in the past for train interiors, they have never been used as extensively as in the Hiawatha. Designer Brooks Stevens has summed up the principal reasons why they were chosen for the job:

"The designer's staff was faced with the matter of car maintenance and long life in first class condition as the controlling factor in material choices, color schemes, and the like. There have been interesting trains produced in the past, which . . . after very little use became shabby and shopworn. . . . In the Olympian Hiawatha, bright, cheerful colors and the discreet use of woods and plastics combine to produce a homey interior in contrast to the regimented look of some transportation equipment which, in general, has had a very cold atmosphere, trimmed with chromium moldings and bizarre lighting schemes."

Monomers, polymers and co-polymers

by WALTER C. VOSS*

How molecular structures and binding forces influence final form of plastics

This article presents a part of the 1947 A.S.T.M. Edgar Marburg Lecture, "Engineering laminates," given by Walter C. Voss at the annual A.S.T.M. meeting of this year. This subject was selected because of the rapidly growing interest in the fields of laminates and engineering composites.

In addition to the discussion of plastics reprinted here, the talk presented a concept of some of the fundamentals involved in the study of adhesives and related materials. Various types of chemical bond stress were described and the need for more fundamental research was shown.

The complete lecture will be issued as a special publication late in 1947. Copies may be obtained by writing the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

THE TREMENDOUS impetus that was given to our knowledge of plastics during the war was due, in part, to the fact that plastics themselves are rationally integrated compounds. They are produced from organic compounds such as coal, petroleum, acetylene, plant or animal products, and contain carbon with hydrogen and oxygen or nitrogen and a very few other elements. They, therefore, are unable to withstand high temperatures without decomposition. The inorganic silicones, on the other hand, resist high temperatures. The organic plastics play an important role in the adhesives presently being used in engineering laminates and it will be wise for us to explore some of their characteristics in some detail.

Long, flat or globular cluster molecules

For a long time many of the organic compounds were considered to be distinctly amorphous and lacking the structure of crystals. Today we know that they do possess organic crystalline structure, that the molecules may be long and narrow as in the long-chain compounds, flat as in aromatic compounds, or a globular cluster with complicated interconnections as in some of the thermosetting plastics. The binding forces may very well be of the van der Waals type as in the hydrocarbons. These forces are so weak and undirected that the form of the crystal is almost entirely determined by the packing together of molecules of characteristic shape as for anthracene and paraffin. The molecules may have local dipoles such as the (OH) group. In such cases, they pack together so that dipoles of opposite polarity are in juxtaposition, as in the sugars and the alcohols.

In the organic acids and bases there are localized electrical charges which attract each other, as in inorganic ionic crystals, but here the shape of the molecule is the fundamental criterion of structure-determining nature. For many years, rubber was thought to be amorphous and to possess no ordered structure. We now know it is a polymerized isoprene (C_5H_6). It is composed of "crystallites" or micelles which have dimensions of 600 by 500 by 150 A.[1]

Plastics, fibers, and rubbers are all organic high polymers, linear in their initial organization, which may be a permanent state or at least a preliminary state in their production. Polymers are made up of monomers and when they occur in a string of only one monomer they appear as:

(-M-M-M-M-M-M-M-M-)

If two or more different monomers exist, a copolymer results:

(M-M-M-A-M-M-M-A-)

This process of forming polymers from monomers is known as polymerization. If in the process of polymerization a by-product, usually water, is formed, the plastic is said to be polymerized by condensation. In nearly all cases the reaction is induced or speeded by the presence of agents known as catalysts. These, of course, do not appear mixed in the final product. In general, the time required for polymerization is reduced by the application of comparatively low temperatures, about 350° F. being the maximum. When single bonds only are necessary to satisfy the elemental proportion, the compounds are called (*Please turn to page 202*)

* Head of Dept. of Building Engineering and Construction, Massachusetts Institute of Technology, and consultant in architectural construction and materials.

[1] The Angstrom unit is equal to one ten-thousandth of a micron or one hundred-millionth of a centimeter.

Luggage of resin impregnated sisal

THE DAY is past when a processor of plastic luggage can confine his work to the production of the molded shell alone. In the current competitive market he must offer a product complete with hardware and appropriate inner fittings to satisfy the demands of the wholesale luggage buyers.

One firm which has successfully developed just such a finished line is F. Burkart Mfg. Co., 4900 N. Second St., St. Louis, Mo. It is now in production on a small overnight case of plastic-impregnated sisal material complete with hinges, a locking catch and an acrylic handle.

One of the nation's largest sisal and jute manufacturers, the company makes its own rope fiber batts for this job and has worked out a special process involving dry impregnation of the filler material with a combination of a thermoplastic and phenolic resins.[1]

During the war period, this firm made fairings for gun blisters. Seeking a civilian item with which to utilize war-acquired equipment and experience, C. Todd Clark, manager of the plastic department, developed the sisal overnight case, measuring 10 by 14 by 6 in. deep. Now reaching quantity output, the product has proved a popular low-priced seller.

Processing the cases

Prior to molding, the sisal batts are cut to shape with steel-rule dies, then impregnated with Resinox phenolic resin, which the company first reformulates to its own specifications by combining it with thermoplastic resins. The dry mix is worked into batts by means of rollers.

Impregnated batts are next placed in an indirect, gas-fired oven and subjected briefly to a temperature of 250° F. This operation causes the thermoplastic components of the formula to flow, but does not initiate cure of the phenolic material. The thermoplastic phase serves to cut down processing time and production costs, eliminating the necessity of working with alcohol and water-soluble resins.

Following the preliminary oven treatment, bottom sections of the cases are molded in a 2-cavity Meehanite die at a temperature of 270 to 275° F. under a molding pressure of 300 tons in a 3½-min. cycle. Removed manually from the die, they are placed on drawn aluminum chilling fixtures to prevent possible distortion. Lids are molded on single-cavity die run on double shifts to keep pace with the bottoms. Dies were produced by Erickson Hat Die Co. of St. Louis.

Hinges, a locking catch and handle anchors are riveted in place, and the cases are equipped with formed acrylic handles fabricated by AAA Plastic Mfg. Co., 308 N. Sixth St., St. Louis. The interior of the case is left unlined and unpartitioned, permitting use of the full 6-in. depth as packing space. At present, these overnight cases are being made in natural phenolic tan and in red. Coloring material is mixed directly with resin. A smaller 8 by 10-in. utility case is in developmental production.

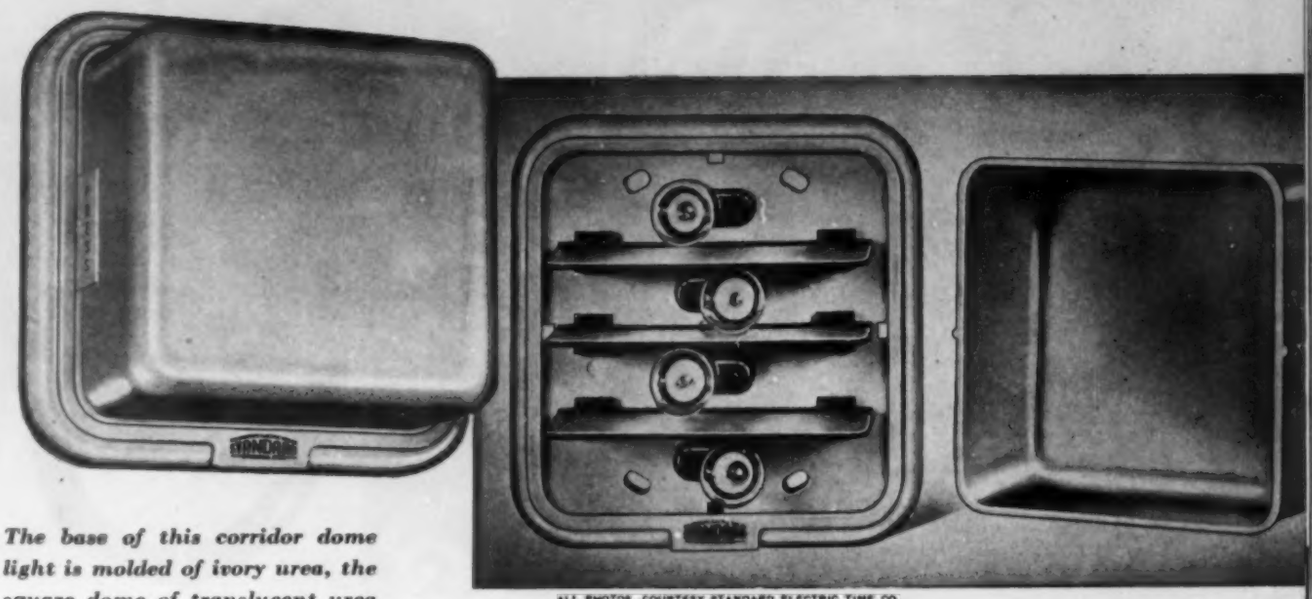
Selling performance and versatility

Typical of the sound merchandising practiced in the presentation of this line is the display featured by Scruggs-Vandervoort-Barney, Inc., of St. Louis. Along with the samples of the sisal material the store exhibits a letter from the company that stresses the rugged properties of cases and recommends them for such uses as wet bathing suits, lunches, cosmetics and gift containers.

[1] Patents applied for on resin formulation and processing of batt.

PHOTO, COURTESY MONSANTO CHEMICAL CO.

Pleasing design of luggage, which is composed of sisal impregnated with a thermoplastic and phenolic resins, can be seen here. Larger case, 10 by 14 by 6 in., is in volume production; the smaller utility case is in experimental production



The base of this corridor dome light is molded of ivory urea, the square dome of translucent urea

ALL PHOTOS, COURTESY STANDARD ELECTRIC TIME CO.

Interior of same dome light shows light barriers of phenolic. The design allows signal to be seen from any angle

Urea molds main parts of signal lights

Parts of these units are compression molded of urea and phenolic for sturdiness and pleasing appearance

IN HOSPITALS, signal units for nurses are subject to constant use. Because of the conditions under which they are used, these units must be able to stand a great deal of wear, yet operate at top efficiency at all times. Too, they should possess a pleasing and restful appearance.

Meeting these requirements are a new nurses' calling station and corridor dome light which are manufactured by the Standard Electric Time Co. of Springfield, Mass., and make use of urea and of phenolic resin in the housings.

Corridor dome light

The corridor dome lights may have one, two, three or four pilot lights, depending upon the number of patients in the various rooms. They are located in the hall right outside the patients' doors and mount directly on outlet boxes. The lamp receptacles are on the front surface of the plastic base plate so that nothing projects into the outlet box.

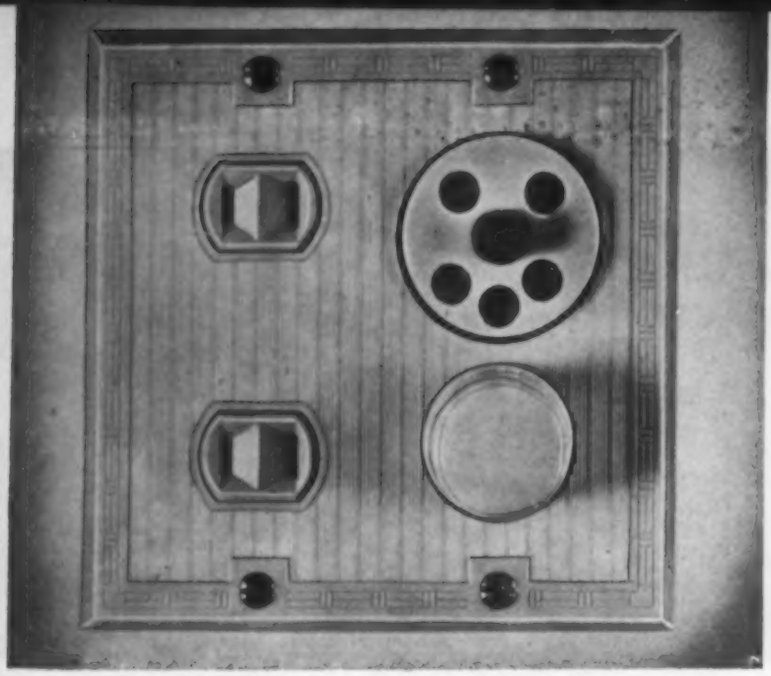
The base plate of the dome light is of ivory urea while the square dome is of translucent ivory urea. Both parts are compression molded of Beetle or Plaskon by Watertown Mfg. Co. of Watertown, Conn., and Colt's Mfg. Co. of Hartford, Conn. The letters on both parts are molded in and later filled in with black paint. The dome snaps into place and may easily be removed.

When more than one pilot light is used, horizontal barriers are placed between the lights so that a nurse can tell at a glance just which patient is calling. These barriers are designed to eliminate blind spots. As a result, the signal lights can be seen from any angle. The Plastics Div. of the Colt's Mfg. Co. of Hartford, Conn., molds these barriers of Durez phenolic. Covers for the sockets for the lamps are injection molded of Fibestos.

Waterproof stations for outside use

All nurses' calling stations up to three gangs are regularly furnished with ivory urea formaldehyde plates, also compression molded by Watertown Mfg. Co. Four main types are available—and these may differ as to number of plug outlets, emergency call buttons, radio and call receptacles, pilot lights, cords.

The weatherproof type for use in solaria, porches and similar places, is provided with a hinged flap which can be closed when the station is not in use. It comes with a 15-ft. portable cord. A second type of station



At left is bedside calling station for ward use. Button unit, right, can be placed on patient's bed for easy use

is absolutely watertight whether in use or not. It is for locations requiring this protection and is provided with gasketed screw cover to be used when the plug is removed. The plug is also furnished with a similar cover to be used when the plug is inserted in the receptacle.

For bathrooms, toilets and other locations where extension cords are not required, Standard Electric Time Co. has designed the wall station type with push button only. A pilot light is optional.

The fourth type is the bedside station for ward use illustrated at left above. This particular station consists of a nurses' call receptacle, pilot light, two electrical outlets, cord with plug and button.

The plug, cord and button assembly accompanying three types of calling stations simplify use of the stations by patients. The button unit may be placed on the bed by the patient or may be conveniently held by a patient in a wheel chair. Both the plug and button are compression molded of Coltrock, a phenol-formaldehyde molding compound, by Colt's Mfg. Co.

New managing editor for Modern Plastics

MODERN PLASTICS is pleased to announce the appointment of A. Paul Peck as managing editor, effective with the present issue. With a wide acquaintanceship in the plastics and other major industries, Mr. Peck has had over a quarter of a century of experience as an industrial science editor and author.

After five years as associate editor of *Science and Invention*, Mr. Peck joined the staff of *Scientific American* in 1926, first as associate editor and later as managing editor and assistant secretary of the publishing corporation. He also found time to contribute widely to the semi-technical press and to report industrial progress through a national newspaper syndicate. Mr. Peck resigned from *Scientific American* in September to accept his present position.

A CHINESE Chest

by J. C. KAZIMIER*

Antique ivory, Chinese red, and jade green chests are available. Each of these chests will hold 1 lb. of chocolates. When the candy is gone, they can be used as jewelry boxes

USUALLY the design of a plastic product is tailored to fit the specifications drawn up beforehand. But sometimes a design becomes the tail that wags the dog. The polystyrene Chinese chest shown here and on the two following pages is a good example.

The customer, Alden Plastic Corp., 230 Fifth Ave., New York City, originally requested a package in the form of a plastic chest of drawers, to hold 1 lb. of assorted chocolates. The package had to be simple, attractive, sturdy, and easily accessible for filling and removal of contents.

Preliminary cost estimates by Amos Molded Plastics showed that the simplest chest, consisting of a case, a back plate, and three sliding drawers, would be too expensive for a novelty package for even the most expensive chocolates. It was then that design and cost considerations caused a change in specifications.

It was impossible to make the chest simple enough to be an economical package. Therefore it was decided to make the product elaborate enough to stand on its own as a saleable gift item, thus allowing sufficient volume to amortize mold costs. At the same time, this would give the product enough eye-appeal and re-use value to stimulate sales when used as a package.

Polystyrene in "Chinese colors"

A Chinese motif was decided upon. Polystyrene was readily available in antique ivory and Chinese red, and a special jade green was developed as a third color. Styron, Lustron, and Bakelite polystyrene were chosen as the materials.

Typical Chinese landscapes were chosen for the top and sides of the chest, and an engraved Chinese design for the front of the drawers. All engraved surfaces are antiqued by spraying on a slow-drying paint and then hand-wiping.

The oriental effect is enhanced by the use of black polystyrene, simulating teakwood, for the base of the chest and for the drawer pulls, which are molded in the shape of dragons.

Design details

The inside of the chest has rails to support the drawers, and slots to accommodate cardboard dividers between the drawers. Two small lugs are molded to the bottom of each drawer to prevent it from falling open when the chest is tilted. These lugs are small enough to allow the drawer to open easily when the handle is lifted slightly.

Stops are molded on to the back edge of each drawer to prevent it from coming all the way out of the chest if pulled too far accidentally, but allowing for easy removal of the drawer from the chest by simply moving it a little to one side.

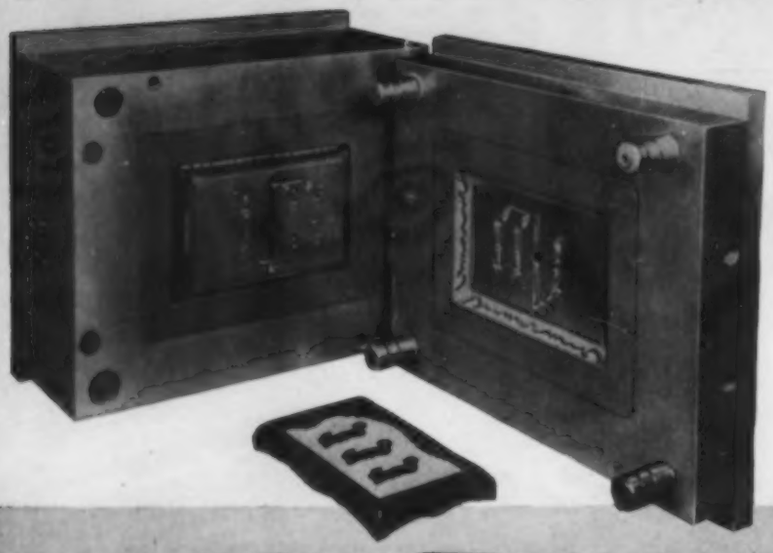
Four dies used

The main part of the chest is molded on a 16-oz. machine in a single-cavity die with three sliding cores. The drawers are molded in a 2-cavity die on an 8-oz. machine, and another 2-cavity die is used on the same size machine to mold the back plate of the chest. The four black parts (one base and three drawer pulls) are molded in a 4-cavity combination die. (*Please turn to next page for photographic story of molding and assembly.*)

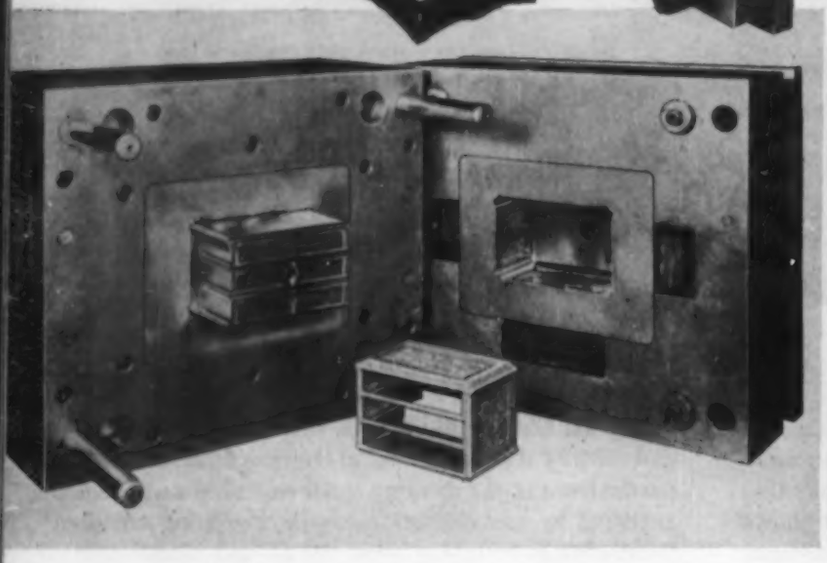
* Chief Engineer, Amos Molded Plastics Div., Amos Thompson Corp., 509 S. Kyle St., Edinburg, Ind.

A CHINESE Chest

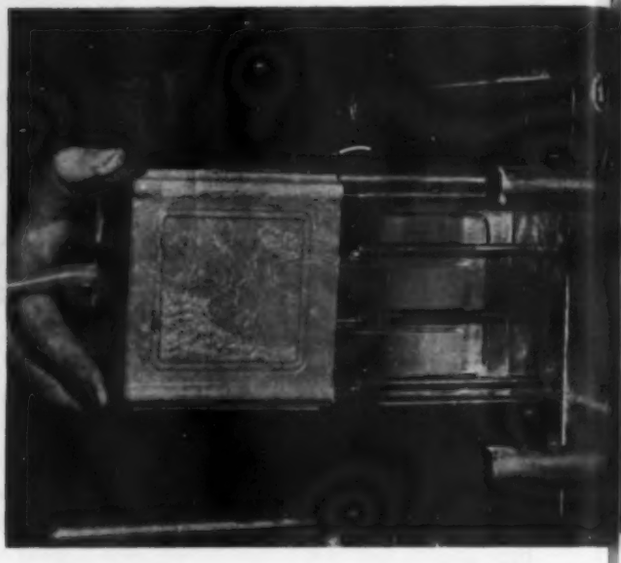
(continued from preceding page)



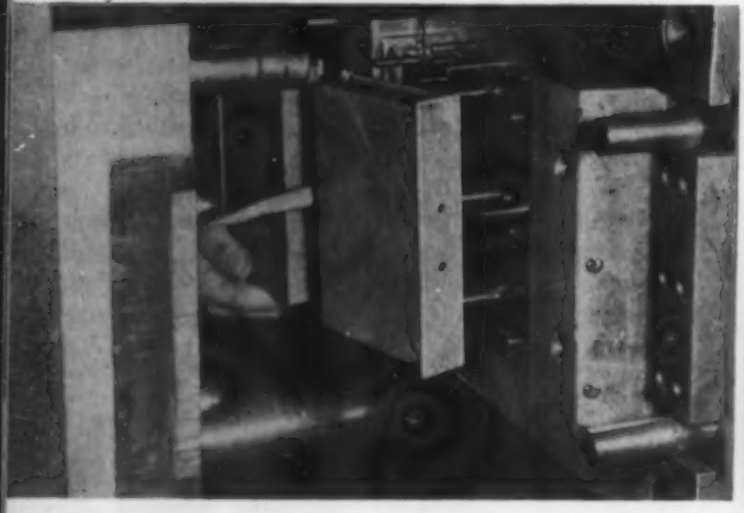
1 *A 4-oz. or 6-oz. machine is used to mold the base and three drawer pulls of the chest. The four pieces are knife-trimmed at the press, utilizing operator's idle time*



2 *The main piece of the chest is molded in this single-cavity die on a 16-oz. machine. The gate from the center sprue, located in the front drawer rails, is machine-trimmed at the molding press*



4 *Main piece is removed from mold. This view shows the three sliding cores of the die. Note runners from center sprue to gates in drawer rails and in the top of the chest itself*



3 *Drawers are molded in 2-cavity die. Another 2-cavity die (not shown) is used to mold the back plates. Drawers are knife-trimmed, but a milling operation is needed to cut the sprues on back plates*

5 *Initial step in assembly is the insertion of cardboard liners between drawers (center). Back plates are then cemented to the chest (left) and multiple clamp fixtures are used to insure adhesion*

8 *At next station on the assembly line, bases are cemented to the chest bodies and held in clamp fixtures to insure a firm bond. The drawers and assembled chests are then buffed (at rear) to remove any excess cement*

6 *Drawer fronts and engraved panels of the chest are sprayed through three-sided mask with special paint formula. Surplus paint is then wiped off by hand (left) to provide the desired antique effect*

9 *Completely assembled and painted drawers are then sorted, mated for color, and fitted into the cabinets (left). The chest then goes to an inspector (right) who removes finger marks or paint smudges*

7 *Dragon-shaped handles are cemented into two holes molded into each drawer front. Milling unit (right) assures proper operation of drawers by governing the size of lugs on the bottom of the drawers*

10 *Final inspector places felt liner pads in each drawer. Packers (above) then wrap each chest in tissue and package it in an individual carton which holds the chest quite firmly and prevents breakage*

Fluorescent lamp molded of polystyrene

SO SUCCESSFUL was the plastic fluorescent table lamp which it introduced about a year and a half ago that the All-lite Mfg. Co., Chicago, has developed and is now marketing a larger lamp of even more distinctive design. Projected maximum output of the new unit, which measures $30^1/_2$ in. from base to finial, is 2,500 lamps daily.

As did its predecessor, the new lamp, designated as Model 101, employs a standard fluorescent tube, mounted vertically within a shaft of translucent molded plastic. Use of the plastic material causes the lamp to emit a soft glow throughout its length; hence the name All-lite. The fluorescent tube provides a continuous column of radiance from base to shade, reducing the "dead center shadow" common to conventional lamps. With the shade removed, the lamp becomes a graceful torchere.

Although the pleasing design of the lamp makes it appear to be composed of only three plastic components, there are actually seven. These include the base, the two identical body sections, the ring which blends them into a single unit, the chimney, measuring approximately $10^1/_2$ in. high and $2^3/_4$ in. in diameter, the cap, and the finial. Elmer E. Mills Corp., 153 W. Huron St., Chicago, injection molds the plastic parts of Lustron and Styron, running the chimney in white translucent material and the other components in variegated tones simulating marble. Total weight of the polystyrene parts is approximately 20 ounces.

The molded plastic parts are notable not only for their attractive design, but also from the standpoint of function. Each is carefully engineered to meet specific service requirements. Thus the base, which supports the entire weight of the lamp, including the glass fluorescent tube, ballast, and switch assembly, rests solidly on four feet which are deeply ribbed on the underside to provide the requisite strength. Openings for the push-button type on-and-off switch and the screw hole

4-COLOR PLATE, COURTESY ALL-LITE MFG. CO.

Soft, comfortable, glowing light without glare is obtained from the fluorescent tube concealed in the upright column of this table lamp. By removing the shade, the fixture becomes a useful and decorative torchere, for use alone or in pairs

Polystyrene parts which make up the table lamp. The assembly in the center shows how the fluorescent tube is supported by a metal channel, with base plate at bottom and bolt at top which holds shade and finial and permits assembled parts to be locked together. Base, at left, has been inverted to show ribbed construction and cored openings for switch buttons and fastening bolt

through which the switch assembly is fastened in position are molded into a recessed section of the base.

The two identical body units, whose tapering contour has vertical ribs, are molded with short ledges or lips at each end. This permits one of the pieces to seat firmly against the opening in the base, while the flaring mouth of the other body section mates similarly with the lower part of the chimney. At their narrow ends, the body pieces slip into the molded ring, seating against an internal ledge.

Heat escapes through openings

The chimney section has five circular openings cored in the top, the center hole permitting passage of the threaded bolt which supports the shade and finial. The cap, smallest of the plastic parts, rests atop the chimney and is designed with four vents around its base. Heat from the lamp escapes through the openings in chimney and cap instead of building up within the plastic shaft.

Weight of the fluorescent tube does not bear upon the sides of the plastic shaft, but is supported by a metal channel that is spot welded to the circular metal base plate, which is concealed in the assembled lamp. This metal channel also provides a conduit for the two wires which run to the upper lamp socket. Both the upper and lower sockets into which the prongs of the fluorescent tube fit are fabricated from fabric base laminated material.

With the fluorescent tube snapped into its sockets, assembly of the lamp is a simple matter. Beginning with the base, each of the plastic parts is slipped over the tube and slid into position. The switch unit in the base is held in place by means of a single small screw. After the chimney and cap have been placed in position, the shade is slipped over the bolt and the finial, with integrally molded threads, is screwed in place.

Mold cavities total 26

Two single-cavity molds are used for the base of the lamp, with two 3-cavity molds for the body sections and a 5-cavity for the ring. The caps are produced in a 6-cavity die and the finials in a 4-cavity mold, while the chimneys, gated on the flaring lower end, are made in a 3-cavity mold. Thus there is a total of 26 cavities for the seven basic plastic units in each lamp. All parts are finished by the molder, ready for assembly by the All-lite Mfg. Co.

All-lite Mfg. Co. first began using plastic materials in its lamps about two years ago, after experiencing heavy shipping breakage with a translucent lamp of pressed glass construction. The 9-lb. shipping weight of the glass lamp, a serious handicap from the cost standpoint, compared with a total weight of only $3\frac{1}{2}$ lb. for the plastic model. Breakage on the plastic unit ran only about 5 percent of that on the glass lamp, and a saving of 20 percent in production cost was realized. The design of the glass lamp housing, and its later modification for the plastic model, is the work of Carl E. Waltman of Chicago.

Mold cost on the original lamp, still in production after an output of approximately 200,000 units, now runs about 3 cents per unit.

The Plastiscope

News . . . Comment . . . Interpretation

For a compact, succinct survey of happenings in and around the plastics industry, get the habit of reading The Plastiscope every month. This regular department in MODERN PLASTICS Magazine reports industrial news, evaluates these reports, takes you behind the scenes on impending events. The Plastiscope appears on page 178 of this issue.

PLASTICS PRODUCTS

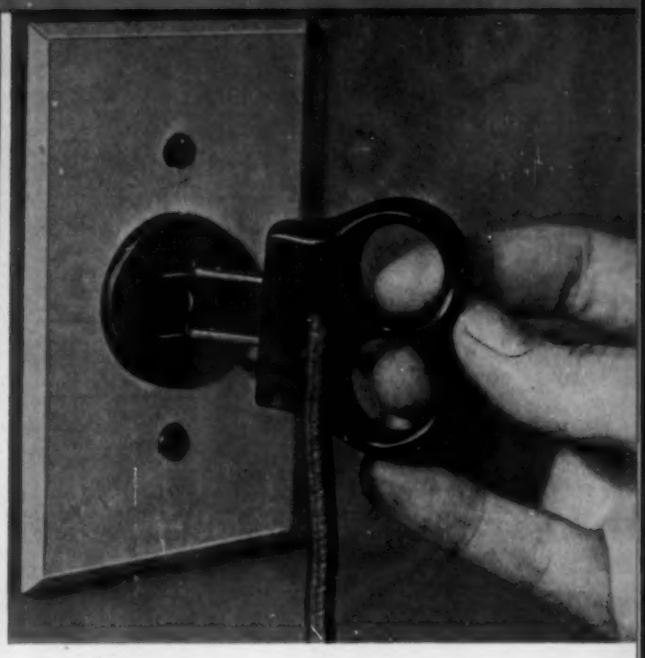
This pocket-size signal generator (used to test radios) has a nose-piece of polystyrene, molded by Adams Plastic Products, 309 Sycamore, Cincinnati 2, Ohio, for Clippard Instrument Laboratory, Inc., 1125-33 Bank St., Cincinnati 14, Ohio

The cook can't hit her head on an open cupboard door in kitchens equipped with these roll-away doors which are made of extruded interlocking strips of Tenite II by the Plastic Process Co. of 662 N. Robertson Blvd., Los Angeles, Calif.

Insulating properties of Bakelite phenolic, which is also opaque to X-rays, led to its use in X-ray tube housing for Westinghouse equipment. The three components are molded by the Shaw Insulator Co., Irvington 11, N. J.

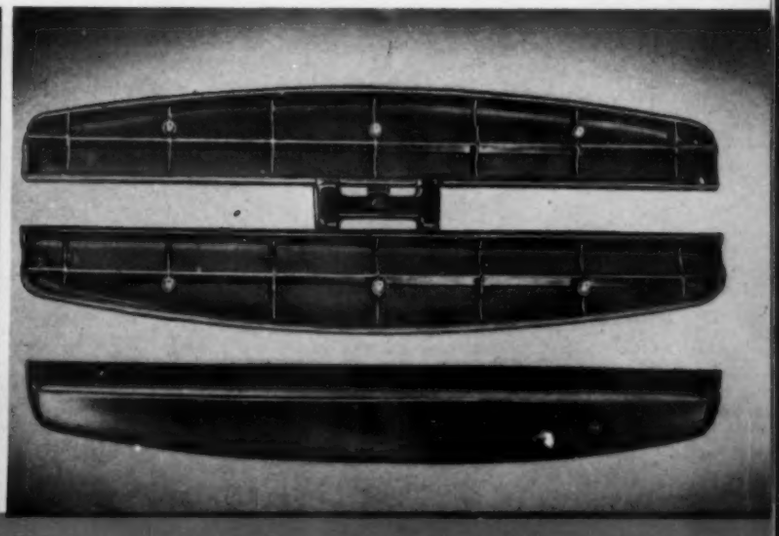
Fiber glass, reported to be coated with vinyl, is used for case of this duffle-type bag. It is one of four being tested by the Navy to replace the present seabag, and features a long zipper and a spacious side pocket

Transparent Celluloid makes for greater efficiency in these pneumatic dispatch carriers. Snap-locking covers hold contents securely while travelling through the tubes and the wide-open end makes loading and unloading simple. The transparent sides expedite delivery because addressee's name can be read without opening container. Neither money nor important papers can be overlooked in the carriers, as was possible with old-style opaque carriers. Made by the Grover Co., 25525 West Eight Mile Road, Detroit 19, Mich.



Yanking on the cord is the easiest way to unplug an electric appliance—and the easiest way to break the wire. This phenolic Thyco plug is a new cure for this practice. Convenient finger holes molded into the plug now make the right way to unplug an appliance also the easiest way. Plug is molded of Durez in a 20-cavity die by Prisk Molding Co., Pasadena, Calif.

Plastic adds to the comfort and convenience of this Barca Loafer, a chair which is designed, as its name indicates, for relaxation and comfort rather than for just plain sitting. Instead of metal, which is likely to be cold to the touch, the arm rests are made of polystyrene and styled in keeping with the streamlined features of the chair. They are molded, a pair at a time, by Worcester Moulded Plastics Co., 14 Hygeia St., Worcester 8, Mass. The arm rests are 19½ in. long, 3 in. wide, and 1 in. high, and have three metal inserts molded in to aid in fastening them to the chair frame. They are produced for the Barcalo Mfg. Co., Buffalo, N. Y., which manufactures the Barca Loafer metal chair

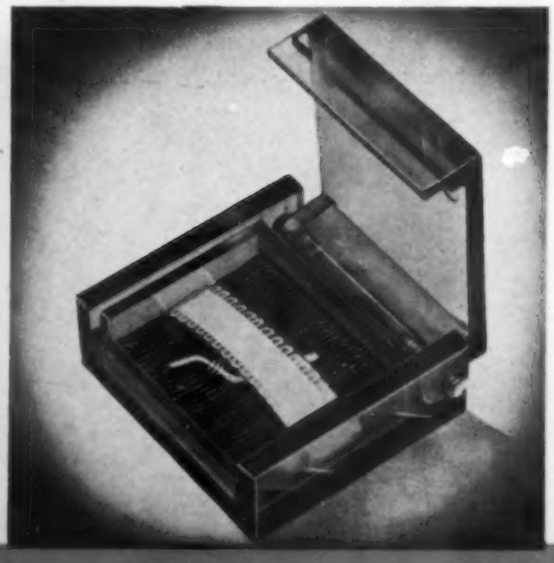


Acrylic is laminated to plywood to make these unbreakable, alcohol-proof plates. Pictures, lace, or napkins are sealed in as decorations. Made by Mahoganite, Inc., 333 St. Nicholas Ave., Brooklyn 27, N. Y.

This therapeutic ear lamp is designed to relieve earaches and inflammation by concentrating infrared rays on the aural canal. The Beetle surface is easily sterilized. Penn-Plastics Corp., Fairhill Ave., Glenside, Pa., molds the two-part urea housing for Air-Shields, Inc., Hatboro, Pa.

Modern women's perennial problem of polishing nails without smearing fingers is simplified by these cellulose acetate Tips, which cover the fingers and leave only the nails exposed. Excess polish falls on the plastic guard instead of the fingers. Fabricated of Lumarith by Pierce Industries, Inc., 3648 Euclid Ave., Cleveland 15, Ohio

Transparent blue Styron is used to mold the container for this phonograph needle manufactured by the Industrial Sapphire Corp., Flushing, N. Y. The two-part box is molded in a 12-cavity die by the Cruver Mfg. Co., 2460 Jackson Blvd., Chicago



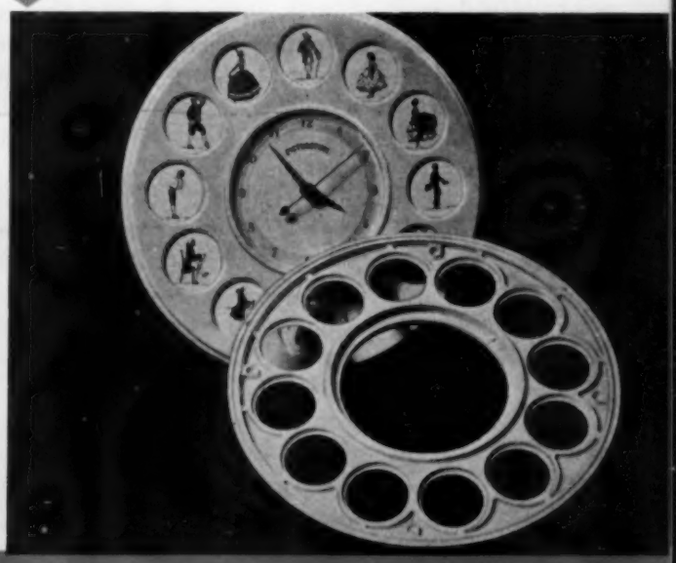
PLASTICS PRODUCTS

Turn the ignition off and this cellulose acetate Key-Ject automatically takes out the key. Printing on the back makes it a useful premium item. Molded by Precision Plastics Co., 4655 Stenton Ave., Philadelphia 44, Pa., for Robert Hetherington & Son, 1216 Elmwood Ave., Sharon Hill, Pa.

The exact fare is ready in this Tenite case and can easily be pushed out with the thumb. A spring holds three nickels in place. Molded by Raycraft, Inc., 2108 Payne Ave., Cleveland 14, Ohio

No knife, warm water, or struggling is needed to remove ice cubes from flexible polyethylene Jiffy Cubes. One cube can be used without wasting the rest of the tray. Larger size, below, holds individual frozen desserts. Made by the Plastray Corp., 823 Fisher Bldg., Detroit 2, Mich.

Ethyl cellulose was chosen for this clock frame for its dimensional stability, machinability, and color. Molded by the Shaw Insulator Co., Irvington 11, N. J., for the Dow-Gunther Corp., Thompsonville, Conn.



Better SIGNS

Plastic materials in an architectural spectacular may some day make Broadway look like this artist's conception. Note package-shaped buildings

Not too far from the artist's ideas are this soda ad (left) with a 7-ft. acrylic tumbler and ice cubes, and beer sign (right) with acetate foam

IF ANYONE were to suggest that Broadway's other name, "The Great White Way," be changed to "Plastic Promenade," he would simply be following logic. Lighted signs or "spectaculars" make Broadway bright— and today those signs are bigger and brighter, more colorful, more realistic, and more active because of new uses of acrylics, acetates, laminates, and other materials. Wherever an explanatory sales message, a story of growth, mechanism, geographical scope, or instruction must be put across, plastics are increasingly important features of signs and accessories.

Applications of plastics to "spectaculars" alone don't represent volume. Fifty 11-ft. bubbles such as those used in the new Ford billboard[1] will use only about 6000 sq. ft. of acrylic sheet. A dozen identical "spectaculars," or a couple of complicated expositions, while offering a nice piece of business to a fabricator, are just so many hand-wrought headaches.

The industrial importance of these big, custom-built signs stems from their unorthodox design, large-dimensional plastic applications, trial and error approach, as well as engineering research concentrated on one problem at a time. Out of all this is coming a body of knowledge about the best ways of using plastics in signs that is being directly applied to mass-production signs in smaller sizes, for stores, offices, factories, service stations, etc.

An example of volume

What these mass-produced plastic signs can mean in volume may be inferred from a single example. Two large gasoline companies are currently testing out three-dimensonal and internally lighted signs of formed acrylic to replace the enamelled sheet steel signs now in use. The plastic signs weigh less than half as much as the steel ones. They are easier to maintain, since the neon

[1] "A mammoth acrylic display dome," MODERN PLASTICS 24, 106, 107 (Oct. 1946).

...with plastics

No other group of materials offers advantages of plastics

tubing is safe inside and there's no external enamel to chip off. One company is having its own special color of acrylic developed while the other is painting the inside surfaces of clear acrylic. These signs are more economical to hang on poles and to operate, since no gooseneck floodlights are required.

Each such sign is about 5 ft. square, requiring about 50 sq. ft. of material for both sides. The two companies operate a total of over 40,000 service sta-

Riverboat scene painted on transparent acetate sheet 15 by 30 ft. gets effect of motion with back lighting

tions; a complete switch from metal to plastic would require 2,000,000 sq. ft. of acrylic sheet. Such an application of plastic *does* represent volume.

Aside from the possibilities in mass-produced signs for national advertisers and distributors are the markets for standardized as well as individualized signs which beauty parlors, stores, bars, bakeshops, and others may use in window and counter displays. Some of these signs, though standard in design, are ingeniously versatile.

In addition to these signs are the purely directional type such as "Exit," "Men," etc., and the instructional signs attached to machines or devices. All these are mass-produced, many from laminates.

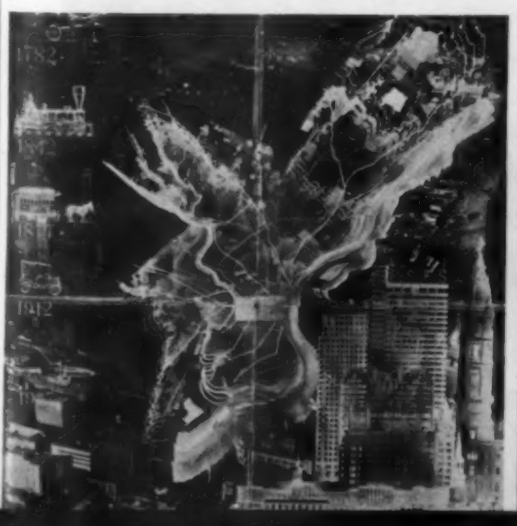
The lessons to be learned about methods of using plastics in signs of all kinds can best be studied by examples and illustrations.

Outdoor "spectaculars"

High over Broadway is a Canada Dry sign featuring two 7-ft. Plexiglas highball tumblers, each containing 300 gal. of colored liquid. Huge acrylic "ice cubes" float in the liquid and bubbles fizz up from a compressor in the base. The tumbler was fabricated by the Steiner Mfg. Co., 47-30 33rd St., Long Island City, N. Y., for Douglas Leigh, Inc.

In Detroit a Koppitz Beer spectacular, designed by Diorama Corp. of America, 410 E. 91st St., New York City, has a beer glass made of 1/2-in. Plexiglas which contains over a ton of dyed water. Fabrication was done by E. L. Cournand, Inc., 3835 Ninth Ave., New York City. At the top of the "glass" and inside the rim, is a tinted Lumarith section representing foam, made in a mold by Czecho Peasant Art Co., 10 W. 19th St., New York City. The foam section contains

Five acrylic maps, one behind the other (left), are lighted in sequence to show the city's growth. Aerial photo (right) rests on plywood, has back-lighted acrylic to show roads and other important features



Rheostat-controlled light glows and fades to change the appearance of this clear acrylic drinking glass

lights and has holes molded in it to allow the compressed air bubbles and heat from the lights to escape.

Southern Comfort, a potent but palatable stimulant, is advertised by a spectacular at the corner of Hollywood's Sunset Blvd. and Vine St. The historic scene depicting the Mississippi river-boat race between the *Natchez* and the *Robert E. Lee* has been painted on a a sheet of transparent Lumarith 15 ft. high and 30 ft. long and is illuminated from the rear by light projected from a series of revolving acrylic cylinders to provide an illusion of motion. Econolite Corp., 3517 W. Washington Blvd., Los Angeles, Calif., created this sign.

A 32-ft. beer glass made of Plexiglas is the center of interest in a Ruppert Brewing Co. sign on Times Square, New York City. This one contains no liquid, but was colored during fabrication so the top is foamy white while the center is amber to simulate beer.

Huge signs such as these involve engineering and fabrication problems not found elsewhere in the plastics or any other industry. The creation of special tools and jigs, special methods of coloring, forming, and finishing all contribute to more efficient use of plastics in large-scale applications—in architecture, for example.

Both high pressure laminates and low pressure moldings have also been used in outdoor signs, although not on such a huge scale. General Electric Co. has had a clock with a Textolite face standing up to the weather atop its Bronx, N. Y., warehouse for at least 10 years. The Firestone "Time to Retire" boy[2] is an outstanding example of three-dimensional low pressure molded work.

Acrylics in indoor exhibitions

In the field of instruction through expositions the acrylic materials lead as materials for signs, because most of these shows are inside buildings. The maps, charts, and other elements in such displays depend largely on light-piping and motion for effect. The light weight of the plastic and its shatter-resistant qualities make it practical for use in travelling expositions. Resin-bonded plywood and laminates are often used with the acrylics.

Currently on view at Gimbel's store in Philadelphia is the 50,000-sq. ft. display of the Philadelphia City Planning Exhibition. This $300,000 piece of visual education depicts what the city was, is, and should be in the future. It shows specific public improvements—proposed, scheduled, and under way—and their cost as well as their advantage to the individual taxpayer. Technical director Oskar Stonorov, widely known modern architect, chose Pearson-Berlinghof, Inc., Langhorne, Pa., to implement his designs.

To show, dramatically, the growth of the city in 165 years, the designers used five maps, one behind the other, illustrating five epochs in the city's development. The maps, on 9 by 10-ft. Plexiglas panels, light up to show the outline of the city expanding magically as each successive sheet is edge-lighted.

[2] "Laminates for outdoor displays," Modern Plastics 23, 100 (March 1947).

Acrylic block letters (left) avoid undesirable light reflections like that on acrylic sheet (right) which looks like plaid apron on waiter. Bottles, glasses, ice cubes, and flower box are all acrylic

Upward growth of the city skyline is demonstrated in one corner of these panels by architecture symbolic of each era, in brilliant outline. In another corner of each map, the date and a symbol of the transportation of the period, from horse to airliner, are outlined.

It was necessary to butt four sheets of acrylic edge to edge to obtain the desired panel size, and each quarter is edge-lighted by two flourescent fixtures. The developed areas, parks, and rivers in the maps were spray-painted with various light colors suitable for edge-lighting, while the highways and railroads were scribed and routed into the plastic for brilliance.

A non-continuous coat of paint

It was desirable to obtain uniform light intensity from panel to panel. Since the panels had widely different amounts of painting, scribing, or routing, the brightness would vary inversely as the total area of decoration on each sheet. Rather than vary the amount of light from the flourescent fixtures, acrylic sheets of different thicknesses from $^1/_4$ to $^1/_2$ in. were used, the thicker sheets providing more light for the more profusely decorated panels. The panels were spaced 8 in. apart to give an effect of depth to the display.

Normally, a solid coat of paint on an edge-lighted panel of acrylic will glow strongly at the edge nearest the light source, but will fade out evenly away from the light. This effect is used to obtain subtly graded light intensity from edge to center of the maps, but it was frequently desirable to avoid such rapid fade-out and to obtain wider, more uniform luminous effects. This was accomplished by spraying a non-continuous film of paint, leaving between paint droplets tiny clear areas which, by internal reflection of light within the sheet, would pipe the light farther along through the sprayed areas. Networks of very fine scribed lines, practically invisible without edge-lighting, were used for the architectural and transportation symbols.

Rods and tubes for piped light

Another project in the exposition uses a 50-ft. aerial photograph of the city (in scale large enough to permit the spectator to find his own house) mounted on four low tables. Hundreds of building and improvement projects are shown in different shapes and colors, projecting slightly above the surface of the photograph and lighted from inside.

The lighting and relief effects are accomplished by using clear rods, tubes, and cut-out shapes of Plexiglas for symbols. These are carefully fitted into drilled and routed holes or slots in the plywood-Masonite combination supporting the photograph. Although the plastic pieces project only $^1/_4$ in. and are only 1 in. in total depth, their polished sides pipe light from banks of fluorescent tubes under the table to the top surface with high intensity. The top of each symbol has a sanded finish to diffuse this piped light and produce a sparkling three-dimensional effect in brilliant color.

To provide the color, the bottom surfaces of the symbols are dipped or sprayed with transparent dyes. In

Back-lighting and stippled paint on rear surface give these acrylic socks the appearance of wool

Above—Aspen plywood surfaced with butt walnut decal is background for molded polystyrene name and frame in this mass-produced beer sign. Below—Etched acrylic sign is edge-lighted by fluorescent tube, has provision for name of individual dealer

Product detail is brought out in this small sign by combining surface coloring, engraving, edge-lighting

Changeable engraved letters in this base-lighted counter sign make unlimited copy changes possible

some cases, black characters, silk-screened on the top surface of the symbols, are silhouetted by the light.

Long, narrow symbols representing new highways, watermains, etc., are particularly effective. The acrylic pieces are merely heated and pressed into curved slots in the plywood to get a graceful winding effect.

In still another project in the same exposition a translucent sheet map became so complicated in surface markings and back-lighting that, to add ringlets around certain points for emphasis, a thin sheet of Plexiglas was placed on top of the map sheet. The circular cuts were machined into the rear surface of the top sheet and were illuminated from hidden edge fixtures.

Objects plus motion

Dioramas are three-dimensional pictures of objects plus motion or the illusion of motion, plus lighting which is also frequently used to provide the appearance of motion. In railroad, airline, and bus terminals—and now even in super-markets—these lifelike miniature "spectaculars" are used as deluxe advertising signs.

A good example is the Coca-Cola sign produced by Diorama Corp. of America. It contains a 54-in. clear acrylic drinking glass formed by Art Plastic Co., 33-22 57th St., Woodside, L.I., N. Y., tinted and etched by the Diorama Corp. of America. Light controlled by an automatic rheostat in the background glows and fades, changing the appearance of the soft drink dyed in the plastic to make travelers realize they are thirsty.

McArthur Advertising Corp., 36-06 43rd Ave., Long Island City, N. Y., makes the three-dimensional displays which appear in Grand Central Terminal, New York City. McArthur uses Plexiglas only and applies Japan colors to the backs of the sheets to get the required shiny effects. They have found that acrylic sheets do not make good background for lettering, because they reflect images of objects in front of the display and destroy the "hanging in air" effect. The two P.M. signs illustrated show, on the right, this undesirable effect and, on the left, the new block letters used by McArthur and made by the Steiner Mfg. Co.

In a Westminster socks ad, also pictured, only the socks are plastic. The effect of wool is obtained by stippling the paint on the back in much the same manner as Pearson-Berlinghof, Inc., used droplets to break up the back lighting in the Philadelphia city growth map mentioned above.

Custom designed, mass produced

In the field of custom-designed but mass-produced signs for big advertisers, an outstanding example is the Schlitz beer sign designed by Dave Chapman, 936 N. Michigan Ave., Chicago, Ill. The background is $^1/_2$-in. aspen plywood made by Kay, Inc., 9 E. 40th St., New York City, and surfaced with a butt walnut decal made by the Di Noc Mfg. Co., Chicago, Ill. Logotype of the name and frame for it are molded from polystyrene by Eclipse Moulded Products Co., 5150 N. 32nd St., Milwaukee, Wis.

This field is wide open so far as choice of plastic materials is concerned. Printed sheet ethyl cellulose,[1] sheet acrylic, cellulose acetate, rigid vinyl, molded thermoplastics, extrusions, and laminates are used with or without plywood, metal, glass, and fiberboard to secure the desired effects. Luminescent effects are obtained, when required, through inks, dyes, or pigments. Some materials are limited to indoor applications.

[1] Modern Plastics *33*, 131 (Feb. 1946).

Where light-piping is needed, the acrylics, of course, have no competition to date, although several copolymers that can be cast or molded possess this property and will compete when priced for volume application and when techniques for their use have been standardized.

Examples of acrylic use in mass-produced signs for store interiors and windows are numerous. They are generally edge-lighted by fluorescent tubes in standard metal bases. They are ordered in quantity by the maker of the brand product being advertised and in many cases the name of the dealer is the only copy or wording change involved. The Conn sign made by Hexco Products, Inc., 315 W. Quincy St., Chicago 6, Ill., has provision for such a dealer imprint.

Special details in small signs

By combining surface coloring with engraving and lamination for edge-lighting, special product details may be featured in a small counter sign. The R.C.A. Victor sign, by Hermes Engravers, Inc., 821 Broadway, New York City, illustrates the "Golden Throat" radio speaker by exactly the same means as were used to present details of Philadelphia's growth in the maps mentioned before.

Baldwin and Shackleton, Inc., 532 Terminal Tower, Cleveland 13, Ohio, produce the "Nu-Ad" sign, designed by George W. Walker. Made of Plexiglas, with a metal base enclosing fluorescent lamps, it uses light-piping and engraving. Innumerable changes in copy are possible by means of changeable engraved letters which have bent tops to fit into slots in the base. This display may be had with a bottomless base so that the sign light can shine down to illuminate a showcase.

The possibilities in this application are enormous. Large letters may be used in the same way on theater marquees. Changeable bulletin boards could be made more effective by the use of the same idea. By the use of symbols instead of letters, worked into large sheets of laminates, educational displays could be devised for the use of platform speakers.

To produce the Cheer Up advertising clock with both face and sides illuminated, Charles L. Dwinell Co., 119–121 W. Eighth St., Kansas City 6, Mo., used translucent Lucite for the case. The same company made the Alpen Brau sign by printing a flat sheet of Plexiglas and then drawing it to shape and back-lighting it.

Oscar Lee, 226 S. Wabash, Ave., Chicago 4, Ill., uses bent $^1/_8$-in. Masonite and molded white or translucent acrylic letters to make a standard mass-produced line of signs for stores, office buildings, hotels and theaters. A choice of over 100 titles is offered in three sizes of signs.

Multi-color laminated signs

Laminated signs have, of course, been in use for many years. In 1942, Mica Insulator Co., Schenectady 1, N. Y., made experimental automobile license plates from phenolic laminates. Henry Henriksen of Plastic Laminart Products, 904 Hodgson Bldg., Minneapolis, Minn., was granted a patent in 1939 on construction of multi-color formed laminate signs with frames and either flat or embossed art work integral. They may be either opaque or translucent, depending on the lighting selected. Fabricon Products Inc., 1721 Pleasant Ave., River Rouge 18, Mich., are working with Plastic Laminart Products on the furthering of this project, which will allow advertisers to use color plates made for magazine advertising for producing permanent signs.

The future of plastics in signs is as unlimited as the imaginations of advertising men and plastics processors. Combinations of laminates with fabricated and molded thermoplastics—of printed translucents with formed opaques—of three-dimensional low pressure moldings with edge-lighted acrylics—are only a few of the hundreds of possibilities.

Translucent acrylic was employed to make the case of this illuminated clock advertising a soft drink

Molded plastic letters feature line of 100 standardized signs for use in hotels, offices, and stores

Heat resistant resin for industrial uses

by W. H. HALLIWELL, JR.*

Machinable and chemically inert, it is adaptable to many specialized markets

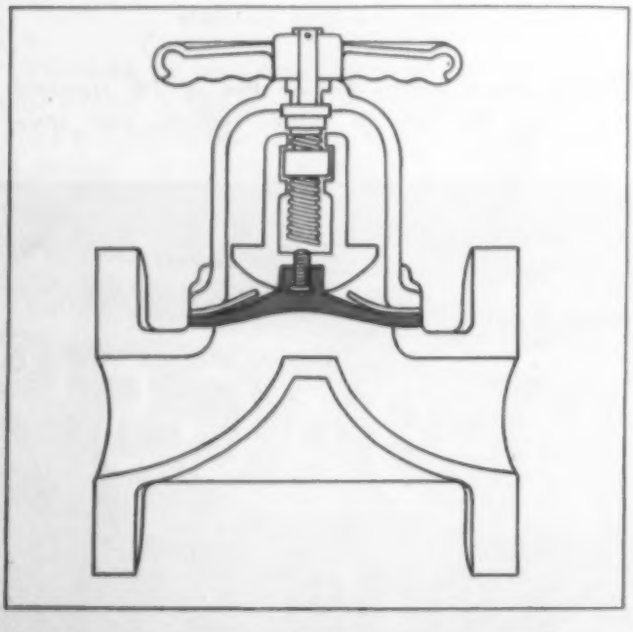
ALTHOUGH still not in full production, Teflon tetrafluoroethylene resin, introduced in 1946[1] by E. I. du Pont de Nemours & Co., Inc., is already becoming widely useful to industry. The four major characteristics of the plastic—chemical inertness, heat resistance, dielectric strength, and non-adhesive qualities—have all been utilized in diversified mechanical, chemical, and electrical applications.

Thus far this resin is commercially available only in the form of sheets, rods, and tubes, although research and developmental work may eventually yield a modified form suitable for conventional molding and extrusion techniques. The virtually complete chemical inertness of the material, coupled with its non-sticky feature, has contrived to prevent development or discovery of a suitable cement for it. As a consequence, all fabrication must be achieved by some mechanical means. Since Teflon has proved adaptable to ordinary machining operations, rather complicated structures can be obtained by conventional methods.

* Technical Service Dept., E. I. du Pont de Nemours & Co., Inc., Arlington N. J.

[1] "A new industrial resin," MODERN PLASTICS 23, 134–135 (June 1946).

A variety of gaskets and packing rings, tubes, tape are among uses now being made of tetrafluoroethylene



Tetrafluoroethylene resin diaphragm (shown red) in valve

Coolants as such are not required in machining operations, but the advantage in employing a stream of water appears to be twofold. Initially, this precaution will result in a more constant temperature of the piece being machined, and closer dimensional tolerances may be maintained despite the material's relatively high thermal expansion coefficient. Secondarily, the possibility of toxic gas release, known to occur at extreme temperatures, should be materially reduced due to more rapid dissipation of frictional heat. Teflon may be drilled, planed, and blanked by ordinary methods. It has been ground to tolerances of ±0.0005 in. with carborundum wheels and jeweler's rouge, and may be threaded successfully by means of a conventional tap and die.

Heat resistance

The material is described and recognized as a heat-resistant compound which may be subjected continuously to 550° F. with little or no embrittlement or other evidence of degeneration over long periods of time. However, use of Teflon at temperatures above 550° F. is not advocated since it has been demonstrated that fluorine-containing gases are released at higher temperatures. Because of this, adequate ventilation should be provided during machining operations.

As an alternative to machining, items which are relatively simple in cross-section may be molded from simple preforms in a positive-type die through application of a few tons of hydraulic pressure.

Probably the most outstanding property of this new compound is its chemical resistance. Exhaustive laboratory tests have thus far revealed only two substances which will attack it. These are molten sodium and potassium, rarely found in industrial processes.

Flat, annular rings of Teflon for use as gaskets are

offered commercially in a range of approximately 80 sizes from $^1/_2$ to 15 in. inside diameter. Since durometer hardness of the material approximates 55 to 70 on the "D" scale, Teflon may be too hard for gasket use with glass-lined pipe or as a replacement for certain synthetic rubbers. To fulfill this need, conventional French-type gaskets are offered. Hardness of the core material will determine their ultimate compressibility.

Packing rings of any type may be readily machined or molded from the material and employed with either rotary or reciprocating-type shafts with the provision that rubbing speeds are fairly low.

Teflon, in common with other plastics materials, has a high thermal coefficient of expansion, and frictional heat developing from high rubbing speeds will not be dissipated due to low thermal conductivity. Consequently, Teflon packing rings will bind on the shaft. For high-speed applications, however, a fibrous packing material has been developed from which one concern is now molding packing rings to order; their successful use in rotary shaft applications at peripheral speeds to 1050 ft. per min. has been reported.

In tubing

Teflon tubing would seem ideal as chemical piping, except that present material cost precludes its use in any but extreme corrosive uses. A further limitation is current inability to extrude tubing with a relatively thin wall. Although $^1/_4$-in. tubing is offered with a $^1/_{16}$-in. wall, large diameters must be manufactured with correspondingly heavy wall thicknesses.

Considerable interest has been evinced in Teflon as a bearing material, possibility, chiefly based on its non-adhesive characteristics. The material in unfilled form may be recommended for this use only at low rubbing speeds and under light load, due to an indifferent resistance to abrasion. Most recent development consists of Teflon filled with micro-pulverized glass; preliminary tests indicate that this combination results in a material having resistance to abrasion coupled with a marked decrease in tendency to cold flow.

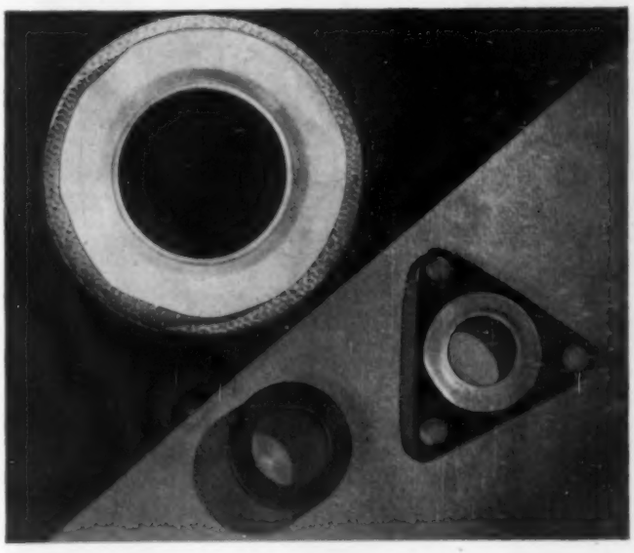
Other features of the unfilled material consist of a low dielectric loss constant, a power factor of less than 0.0005 over the entire range of frequencies, and water absorption rating of 0.00. These combine to render the materials adaptable to diversified electrical uses, particularly where extreme heat resistance is a correspondingly important factor.

Teflon sheet stock is available in both oriented and unoriented grades. Unless otherwise specified, sheet stock is baked in a frame somewhat smaller than the finished sheet. In order to obtain constant caliper and good surface finish, the sheet is then subjected to a cold working process resulting in elongation of the sheet in both directions. In high-temperature service, the sheet may tend to distort and re-assume original dimensions so that only unoriented material should be specified for such service.

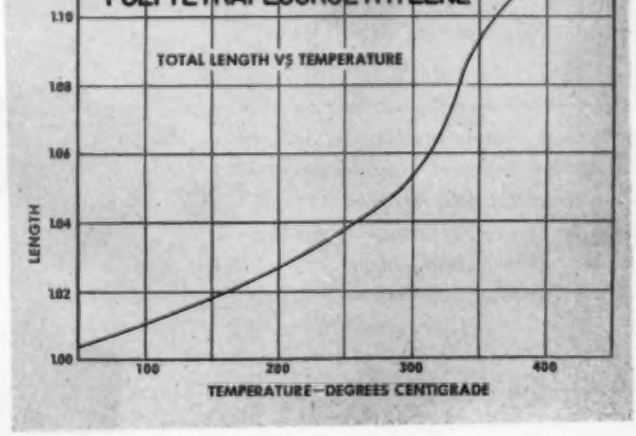
Non-electrical Teflon tape finds its widest use in heat-sealing applications where it is employed to cover heater plates and heat-sealing jaws, preventing or minimizing deposition of carbon and wax on these elements. One other application where the material is becoming increasingly popular is as a diaphragm facing in diaphragm-type pumps and valves.

New uses being sought

Since the material currently is being evaluated by individuals and concerns representing a wide industry range, many new uses for it may be evolved in the future, especially in applications where high temperature and corrosive conditions have to be met. It should be pointed out, however, that this plastic is not recommended for use where substitute materials will serve equally well, but should be considered only where long service life and consequently low replacement cost will compensate for relatively high initial cost.



Resistance to chemicals and anti-adhesive properties are among advantages of tetrafluoroethylene gaskets



As the temperature rises, linear expansion of polytetrafluoroethylene occurs at the rate shown above

Binocular of molded plastic

Light weight, attractive appearance, low cost led to use of cellulose acetate butyrate in this unit

PHOTO, COURTESY TENNESSEE EASTMAN CORP.

Eye-piece focusing, plus adjustment of the interpupilary distance, are features of this binocular

HOW INGENIOUS die design can eliminate laborious finishing operations and yield a better, more attractive plastic product is exemplified in the Sport-Lite Binocular, produced by National Instrument Corp., Houston, Tex. Although retailing in the low-cost bracket, this three-power instrument is made to exacting optical standards. Except for the lenses it consists entirely of Tenite II components injection molded by Kuhlman Plastics Co., 1605 Norton Ave., Kansas City, Mo., which firm also designed and made the molds.

According to E. D. Ernst, sales promotion manager of National Instrument Corp., his company specified

Above—Cellulose acetate butyrate components of binocular consist of left and right barrels, stemmed focusing knob, cap, retainer rings, and internally threaded eye pieces

Right—Two matched sets of right and left barrels are produced in 4-cavity die in one molding cycle

plastics for a number of reasons. Since the instrument was intended for the low-price field, it was felt that a molded plastic would permit speedy, economical production. Also, it was desirable to keep the binocular as light as possible, consistent with the material strength required for such an instrument. Cellulose acetate butyrate was found to meet these requirements quite satisfactorily.

A finished product was attained which had attractive appearance, with the added mechanical advantage of "built-in" gears to focus the eye pieces. Finally, production and assembly were greatly simplified because no painting, refinishing, expensive processing, or gear cutting was involved. The manufacturer's production problems consist solely of mounting the lenses and assembling the finished molded pieces into the complete binocular.

Ring gate equalizes pressure

The largest plastic parts for this instrument—the barrels—are produced in a 4-cavity die which makes two matched sets of right and left barrels. Approximately 5 in. long and 2 in. in maximum external diameter, the barrels are gated at the small (eye piece) end with a modified type of ring gate which equalizes the pressure of the molding material on the cores and keeps them accurately aligned, resulting in improved strength characteristics in the finished piece.

The large core pins, which form the tapering, longitudinally ribbed interior of the barrels, are sandblasted to produce a glare-free inner finish and eliminate reflections. Exterior surface of the barrels is stippled for appearance and easy grip. Interrupted threads on the eye piece end eliminate the problem of flash in the threads. The barrels have cored extensions which are later joined by a focusing knob and stem to form the finished binocular.

Eye pieces, internally threaded to mate with the barrels, are molded in a 6-cavity die equipped with automatic unscrewing mechanism. Another 8-cavity mold produces the stemmed focusing knobs and caps. Stems are cored to maintain dimensions and eliminate excess material. The fourth die used on this job turns out four large and four small retainer rings which hold the lenses firmly in position and alignment in the barrels and eye pieces.

Simultaneous adjustment of lenses

In the assembled binocular, the teeth of the focusing knob mesh directly with those of the eye pieces, providing simultaneous adjustment of the two lenses for near or distant objects. The design of the molded parts also permits easy adjustment of the interpupilary (between-the-eyes) distance from a minimum of $2^3/_8$ in. to a maximum of $2^5/_8$ in., assuring comfortable adaptation of the instrument to the eyes of the individual user.

Over-all length of the binocular is $5^3/_8$ in. when closed and 6 in. when extended to its maximum length. The instrument is rated as a 3 × 40; it magnifies three diameters and objective size is 40 mm.

Scrap reprocessed

under new service plan

A REPROCESSING plan to help move idle inventories now held by molders and fabricators of cellulosic molding materials in colors and formulations unsuited for immediate use, has just been announced by the Plastics Div. of Celanese Corp. of America. Under this new service for the plastics industry, any cellulose acetate or ethyl cellulose that can be reformulated into a molding material suitable for the intended application will be accepted for analysis and reclamation, regardless of its original source.

The plan aims at reducing the possibilities of improper applications inherent in large accumulations of dormant materials, some of them left over from wartime. Attempts to achieve this by "reworking" materials have often failed, frequently resulting in formulations not suited for the new end uses and in large poundages that had to be sold as scrap at prices as low as 4 cents a pound.

The Celanese plan of reformulating and reprocessing will employ all the facilities used in compounding new plastic materials.

How the plan works

The new service applies to cellulose acetate and ethyl cellulose plastics in quantities of 1000 lb. or more. Customers will send representative samples of the materials to be reprocessed with as much information as is possible about the article to be produced and the colors desired. The Celanese laboratory will then analyze and develop a formula to meet the customer's planned end use—reformulating, reprocessing, and recoloring, adding virgin flake and plasticizer when necessary. The charges will be moderate—in some cases as low as 10 cents a lb.—and will depend on the kind of service and quantity of virgin material necessary.

The announcement emphasizes that Celanese is not entering the scrap business. They will neither buy nor sell the scrap; it will remain the property of the customers at all times. The service will be performed at the Newark, N. J., Celanese plant, adjacent to air, rail, land, and water depots of the major transportation lines of the country.

Celanese is confident that the new service will not only help the industry to move idle inventories and reduce scrap losses but that it will also put back into use large accumulated amounts of contaminated stock and otherwise unusable material.

PHOTO, COURTESY DETECTO SCALES, INC.

PHOTO, COURTESY GENERAL ELECTRIC CO.

Left—Clerk-side view of candy scale is shown here. In finished scale, open space in center has racks for storage of counterweights. Right—One piece housing is molded of urea-formaldehyde

Scale housing molded of urea

CANDY, ACCORDING to an old familiar saying, is dandy. But those who make products which must come in contact with candy have other ideas. They have found that candy in general, and salted nuts in particular, can play havoc with many conventional structural materials.

Detecto Scales, Inc., 1 Main St., Brooklyn 1, N. Y., had such problems with the housing of its candy scale. After trying three different types of metal, Detecto has found a solution in the use of urea.

Appearance important to sales

The front appearance of a candy scale is of the highest importance. A worn or pock-marked scale gives customers an impression of uncleanliness, and sales are bound to suffer.

Detecto's first candy scale had a housing of cast iron covered with white enamel. In ordinary service the enamel became chipped, leaving black spots which made the scale look dirty. Detecto switched to polished cast aluminum, but salt from nuts caused pit marks. Cast nickel silver was then tried, with only slightly improved results.

White urea for clean appearance

Detecto's latest model candy scale has a urea formaldehyde housing which will continue to look clean despite constant contact with salted nuts, candies, and other confections. In addition, the use of plastic makes a one-piece housing feasible and allows for more attractive design.

The housing is molded for Detecto by the General Electric Co., 1 Plastics Ave., Pittsfield, Mass. A single-cavity die is used. The material is Plaskon, the color is white, and the finished piece weighs 50 ounces.

The inverted-T-shaped housing is 14 in. wide, 13 in. high in the center, and is open at the top so that both customer and clerk can see the weight indication scale. There is also an open space in the rear to allow for the storage of counterweights. On the sides, the housing is 5 in. high.

The only finishing operations necessary are some hand filing to remove flash, drilling two holes in the housing, and retapping inserts.

Additional applications planned

The Detecto company is so well satisfied with the plastic housing that it plans to switch from metal to urea for the tray in which the candy is weighed. It is also considering the use of plastic housings for the other types of scales it makes. Bathroom scales, which are unavoidably subject to damage by rust if they are made of metal, are one of the obvious possibilities for such a switch.

Vinyl covers wires, yarns

Flexible or stiff, as desired, film provides abrasion resistance, electrical insulation, and built-in color possibilities

WEAVING yarns or insulated wires with excellent abrasion resistance and decreased flammability are being produced by a new process developed by the Tensolite Corp., 17 East 42nd St., New York City. The process, called tensolizing, uses vinyl film to cover rayon, cotton, silk, Fiberglas, or wire cores, and the end product can be made flexible or stiff, as desired.

Yarn can be given 100 percent dimensional stability or considerable elasticity. "Hand," drape, insulating quality, and other characteristics can be varied by changing the vinyl formulations or wall thicknesses. In addition, color can easily be incorporated by using colored vinyl film, colored cores, or both.

Steps in the process

The same method of applying the covering is used regardless of the core. The unique feature of the process is the application of a vinyl tape *parallel* to the core, rather than around it spirally.

The vinyl film is first slit to form rolls of tape. The width of the tape is determined by the circumference of the core and the number of times the tape is to be wound around it. Three or four plies of film are used in most applications.

Electrically heated rollers are used to bring the tape to the temperature required for complete lamination and coalescence. The tape is then threaded in a machine which rolls the tape into a continuous tube around the wire or yarn. Stabilizing and relaxing the finished product at room temperature completes the process.

Varied applications

The greatest use of tensolized wire will probably be in small size wires for instruments, telephone head sets, hearing aids, radio hook-up wires, and electric blanket heating elements. The chief advantage is that the wires are perfectly centered; the covering conforms to the outside surface of the wire rather than to the inside surface of a die.

Perhaps the most interesting application of the new process is the production of vinyl-covered Fiberglas yarn. Uncovered Fiberglas yarns are strong, dimensionally stable, impervious to most chemicals, and nonflammable. But their use in woven fabrics is limited because they have been found to lack abrasion resistance and adequate color.

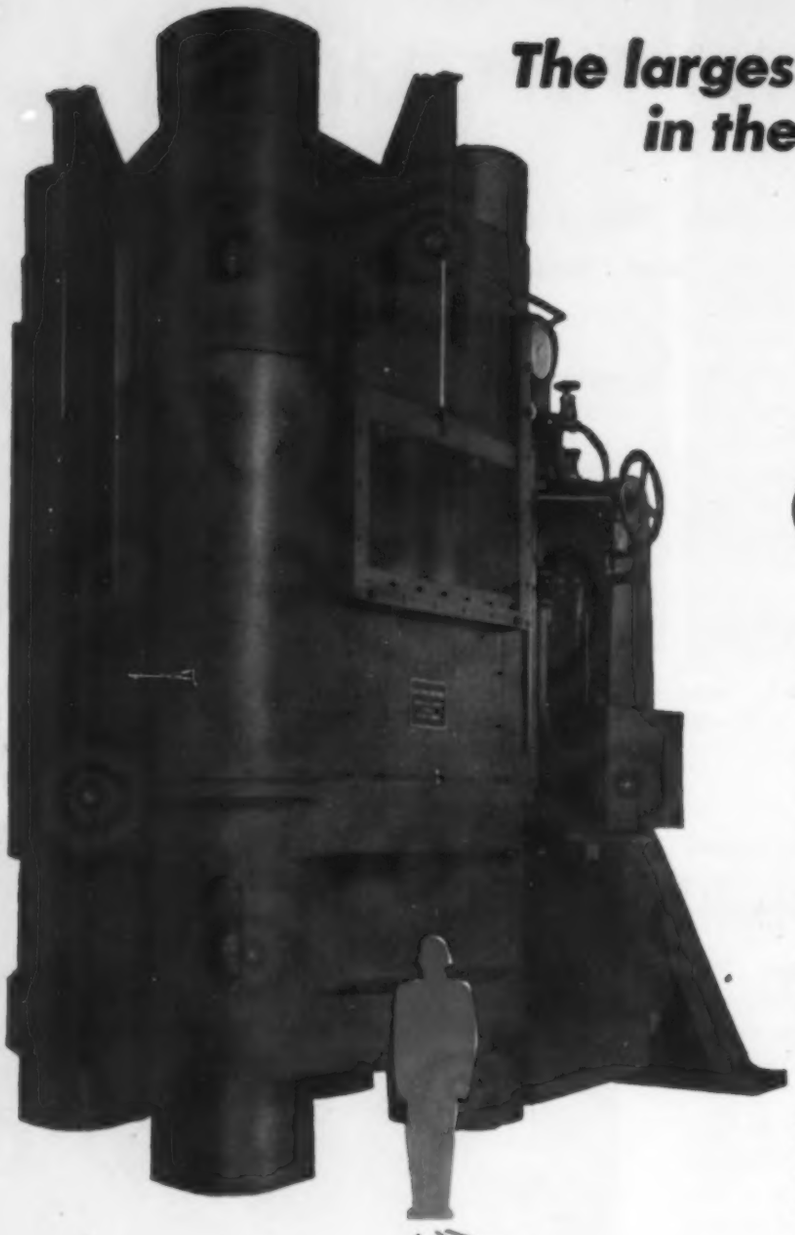
The tensolizing process eliminates these two disadvantages of the uncovered yarn without sacrificing any of its valuable characteristics. As a result, vinyl-covered Fiberglas yarn is being used in flame-resistant, long-wearing drapery and upholstery fabrics; rustproof screening; luggage fabric; dimensionally stable shoe fabric; belts and webbings; and braids for clothes lines, dog leashes, etc.

In cost, tensolized wires are competitive with comparable products, but the covered yarns are more expensive than coated yarns or extruded monofilaments. The covered yarn costs are expected to decrease as volume increases.

Electrical wires of all kinds can be insulated with vinyl tape and further protected by tensolized yarns

Textile fibers coated with colored vinyl can be woven, knitted, crocheted, or braided in attractive patterns

The largest hobbing press in the plastics industry



Hobbed Cavities *by* Midland . . .

An important addition to Midland's expanding facilities is this 8000 ton hobbing press, the largest of its kind in the plastics industry.

This mammoth press with a ram diameter of 39½ inches makes it possible for Midland to hob cavities of approximately 80 square inches . . . almost tripling former hobbing limits.

With this press, Midland is prepared to supply plastic molders with hobbed cavities for large plastic parts including radio cabinets, large container escutcheons and instrument housings. Multiple cavities can be hobbed . . . "like peas in a pod" . . . quickly, with complete uniformity and accuracy. Multiple cavities will speed up your production with a minimum of expense.

Midland experience and facilities, in addition to skilled craftsmen, are ready to serve you . . . to produce the finest and deliver on time when you specify "Hobbed Cavities by Midland."

Write for your copy of "How to Heat Treat Hobbed Cavities," a practical heat treating treatise to help you get the best performance from Hobbed Cavities by Midland.

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Plastics Engineering*

F. B. STANLEY, Engineering Editor

Teamwork develops better, smaller relay

Phenolic, urea-formaldehyde, and vinyl parts, each proved by intensive tests, contribute to longer service life of an important electrical unit

by C. D. LAKE and WM. M. HOYT, Jr.†

Satisfactory utilization of plastics in industrial applications frequently calls for complete cooperation between plastic and development engineers. The accompanying article is of special interest and importance because it shows how typical development problems in a specific case were met and solved through such teamwork.

AS A RESULT of several years of intensive development work, an electric relay of advanced design has been developed for use in our company's business machines. Though 75 percent smaller than the relay it replaces, it has many advantages including ease of installation and servicing, and longer service life. Playing an important part in the performance of this relay are four plastic parts—two employing two different types of phenolic, one made of urea-formaldehyde, and one made of vinyl. Each was selected for one or more reasons after many tests.

The story behind the plastic parts used in the new relay illustrates the effective results of cooperation between the development engineer, the plastic engineer, and the molder in developing the most suitable plastic part for each application from a performance and molding viewpoint.

Figure 1 shows the new relay as originally designed on the left and in its final form on the right. The relay shown is called the four-position relay, although six-position and twelve-position relays of similar design are also made. These are the wire contact type.

* Reg. U. S. Patent Office.

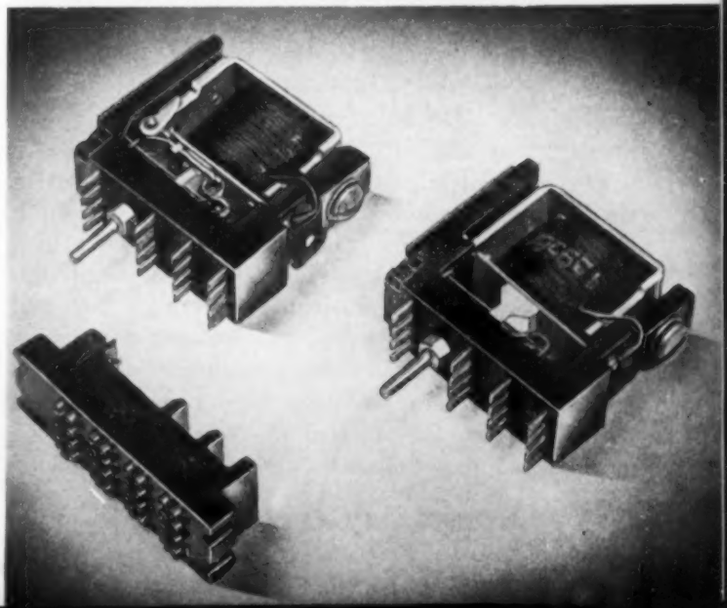
† Respectively, senior development engineer and plastics engineer, International Business Machines Corp., Engineering Laboratory, Endicott, N. Y.

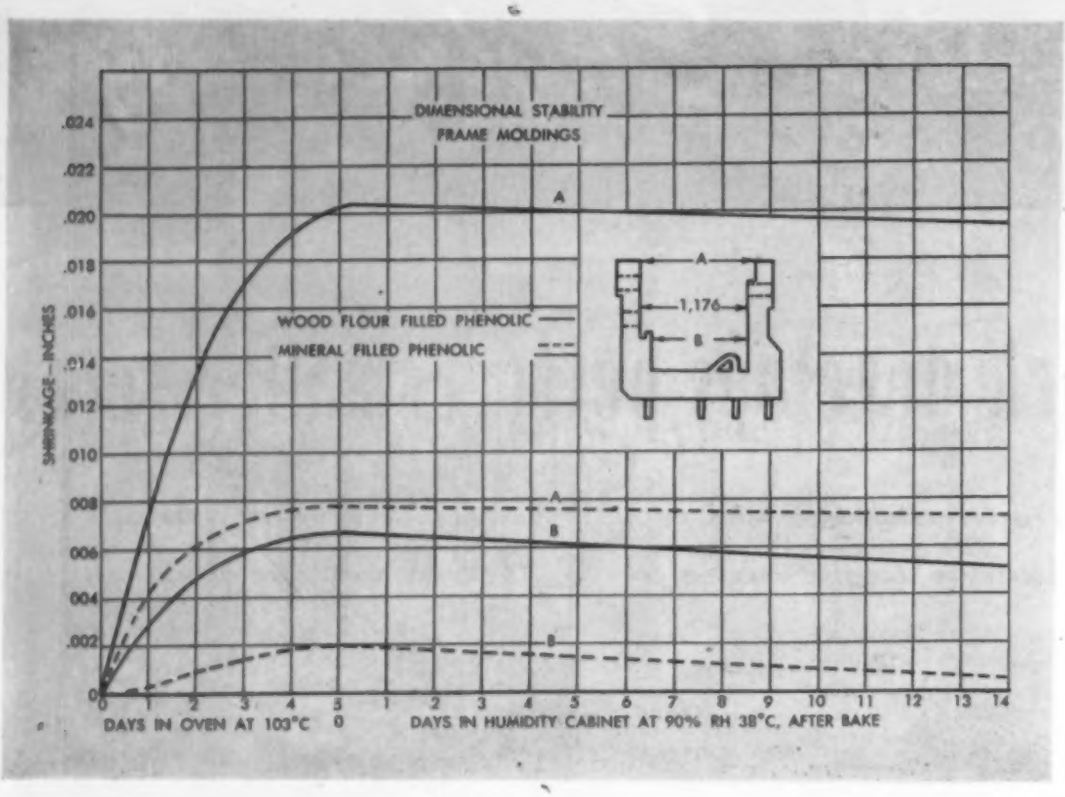
The plastic parts used in this relay are: 1) phenolic frame, 2) phenolic terminal molding, 3) urea-formaldehyde armature bracket, and 4) vinyl vibration damper. Each part presented an interesting problem from a material selection as well as a design viewpoint and underwent many changes before reaching its final form.

Frame molding—The frame molding is one of the most important components of the assembly. It supports the other operating members and in it are incorporated several small and intricate silver and brass inserts which carry the current to and from the relay. The frame is essentially a "U"-shaped molding. When the steel yoke which supports the magnet and coil is attached by screws to the legs of the frame, the yoke closes the open end of the "U." Consequently, the distance between the legs of the frame must be held

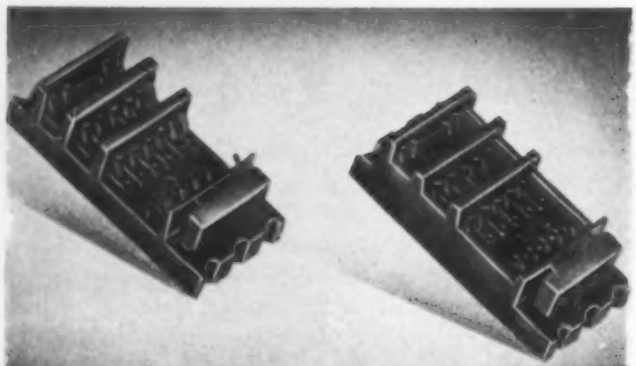
1—*White urea armature bracket attached to armature is shown here. A terminal molding is at lower left*

ALL PHOTOS AND DRAWINGS, COURTESY INTERNATIONAL BUSINESS MACHINES CORP.





2—Frame moldings from two types of phenolic material were tested for dimensional stability. Change in distance between legs of frames during aging is shown here



3—At left is original terminal molding design. At right is final product with web added on each side

within relatively close tolerances in order to assure a proper fit between yoke and frame when the two are assembled, and thus prevent stressing the molding severely. Specifically, the critical dimension between the legs is 1.176 in., with a tolerance of $\pm \frac{0.005}{0.000}$ near the base and ±0.007 at the open end.

The material originally selected for this application was a general purpose phenolic molding compound, chosen because of its good flow characteristics in a transfer mold—a property considered to be highly important because of the intricate design of the part and its inserts. However, it was soon found that, although the parts were within tolerances immediately after molding, after they had been in storage for a short period of time the internal stresses induced during cooling, and accentuated by moisture pick-up or loss, caused the legs of the frame to move either out or in excessively, resulting in loosening of the screws and subsequent loss of relay adjustment.

Sample moldings were then made of an asbestos filled phenolic compound. Moldings of this material and the general purpose material were tested by exposing them first to a temperature of 103° C. for five days and later to an atmosphere of 90 percent R.H. at 38° C. for 14 days. The change in distance between the legs of the frame at their ends and base during this test is shown in Fig. 2. Squareness of the legs to the base was also checked before and at the conclusion of the test. It was observed that, although all the moldings were square before the test, at the end of the test the mineral filled moldings were substantially square while all of the wood flour filled moldings had warped noticeably.

Modification proved necessary

Based on the results of this test, the material specification for the frame was changed to a mineral filled phenolic compound. Shortly thereafter the attention of the molder was called to deformed inserts in the molding. In studying this problem with the molder, analysis of the defective moldings revealed that only the inserts directly adjacent to the gate of the mold were being deformed. It was concluded that this condition was caused by the excessive pressure required to transfer-mold the mineral filled compound. Consequently, after sample moldings had proved the effectiveness of the modification, the material specification was modified to call for a compound composed of 75 percent of the mineral filled phenolic material (Durez 34) and 25 percent of a general purpose phenolic material which improved the moldability of the compound without

detracting appreciably from its dimensional stability. This is the material now being used for this part.

Terminal molding—The terminal molding is shown in Fig. 3 and in the lower part of Fig. 1, the part on the left in Fig. 3 being the original design. In use, the terminal moldings are mounted on a panel of the machine and into them are plugged leads from the machine circuits. These circuits are then completed by plugging the relay itself into the terminal molding.

When the frame and terminal moldings were first designed, it was decided that both should be made from the same type of plastic material. This would prevent the introduction of stresses in a frame-terminal assembly which might result from the difference in dimensional changes that usually occurs when two different types of molding materials are exposed to the same atmospheric extremes. However it was found side walls of the terminal moldings were breaking when the leads from the machine circuits were being plugged into the contact springs of the terminal moldings. This breakage was caused by excessive straining of the molding when tight fitting plugs were forced into the outer molded holes, for the outer wall of the molding is only 0.040 in. thick.

Two steps were taken to correct this condition. First, a web was added on each side of the molding as shown on the right in Fig. 3. This web gave some additional support to the side walls and also helped prevent any tendency of the terminal to warp out of flatness. Secondly, it was found that the use of a cotton-flock filled phenolic compound would improve the resistance of the part to cracking during assembly without any appreciable sacrifice in molding performance. Accordingly, the change from a wood flour filled phenolic to the improved impact type phenolic material was made. Since that time, observation of a large number of frame-terminal assemblies has shown this combination of a mineral filled phenolic molded frame and cotton-flock filled phenolic (Bakelite 6260 resin) molded terminal to be satisfactory.

Armature bracket—The selection of the best material and the determination of the most satisfactory design for the armature bracket was one of the most interesting problems in connection with this relay.

When the relay coil is energized the magnet attracts the armature to which is attached the white bracket molding that can be seen in Fig. 1. Since the armature is pivoted at one end, it moves in an arc causing an imperceptible but none the less significant movement of the wires across one face of the holes through which they are threaded. Armature and armature bracket in various stages of development are shown in Fig. 4.

Plastic required for insulation

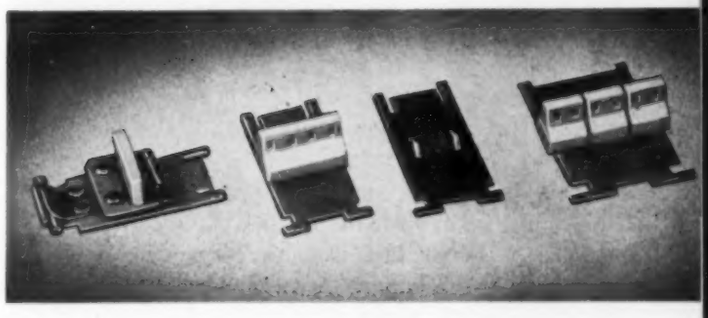
Since the armature bracket must serve as insulation between contact positions and between the wires and armature, the need for a plastic material for this part was obvious. Due to the wearing action of the wires on the face of the holes in the bracket, it appeared desirable to select a material for this application having good surface hardness. For this reason, an alpha-cellulose filled urea molding material was chosen.

In the initial design, shown at the extreme left of Fig. 4, the urea bracket was a separate, L-shaped molding which was riveted to the armature. Very little difficulty was experienced with this assembly. After the initial phase of the relay development was completed, attention was turned to simplification of all the components of the relay design to reduce the cost of the relay without affecting its performance.

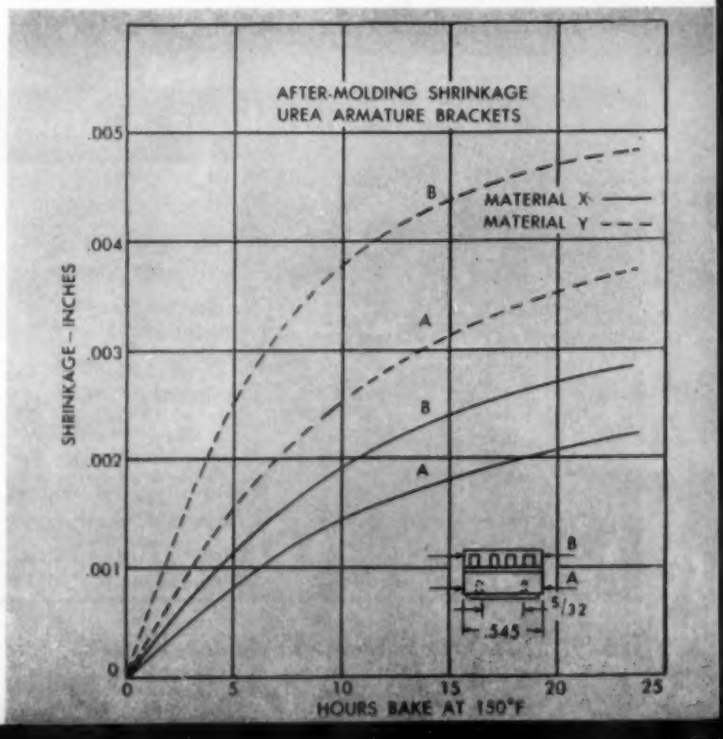
One part which lent itself admirably to redesign was the armature assembly. The armature and armature bracket were simplified as shown in the center of Fig. 4, resulting in the elimination of four parts in this one assembly. In the simplified design the urea bracket was attached to the armature by placing the armature in the mold and transfer-molding the urea material around two ears sheared from the armature. These ears, which are shown in the view of the armature insert in Fig. 4, acted to anchor molding to armature.

Experimental moldings of these parts were placed

4—Armature and armature bracket in various stages of development. Note change in shape, location of ears



5—Shrinkage of two different urea material moldings attached to armature by two ears is compared below



on test and after a relatively short period of time it was observed that the moldings were cracked in one or more places. It was immediately evident that the cracking was due to the after molding shrinkage of the urea molding material. In subsequent efforts to produce crack-free armature bracket moldings the investigation went through three distinct phases.

Shape and location of ears changed

First, many minor modifications of the shape and location of the ears were made. Since the electrical engineers believed that shearing an ear out of the center of the armature would produce an unfavorable effect on the magnetic field induced in the armature by the magnet, thereby slowing the operation of the relay, efforts to correct the difficulty by minor redesign were hampered by the necessity of using two ears spaced some distance apart rather than one centrally located in the moldings. However, many moldings were made and tested in an accelerated aging test recommended by the material manufacturer. Some of the data obtained is presented in Fig. 5, because of its interest as an example of the after-molding shrinkage of urea molding compounds. In this test, 24 hr. at 150° F. is considered to be the equivalent of one year's aging under normal conditions. Fig. 5 compares the shrinkage of two different urea material moldings attached to the armature by two ears spaced $^5/_{32}$ in. apart. The difference between the "A" and "B" dimensions is an indication of the restraining action of the inserts on the natural tendency of the urea to continue to shrink after molding. Unrestrained, this may amount to 0.008 in. per in. to 0.013 in. per inch.

In this particular test, using an ear spacing of $^5/_{32}$ in. as compared with the original spacing of $^7/_{32}$ in. which caused cracks, the moldings made from material X did not crack. However, this combination of material and design did not appear promising for the armature bracket molding for the 12-position relay, which is approximately three times as wide as the four-position relay. Therefore, moldings were made from both cellulose and mineral filled melamine using an ear spacing of $^5/_{32}$ inch. These were baked for 48 hr. at 220° F., the higher temperature being recommended in order to obtain a better indication of the aging properties of the melamines. The total shrinkage of these moldings is shown in Fig. 6. Data are also included for some moldings made of urea material X for comparison. In this test, none of the melamine moldings cracked, though all the urea moldings did except those conditioned at 150° F. for 24 hours. Differences in original shrinkage of the three materials should also be noted.

Melamine versus urea

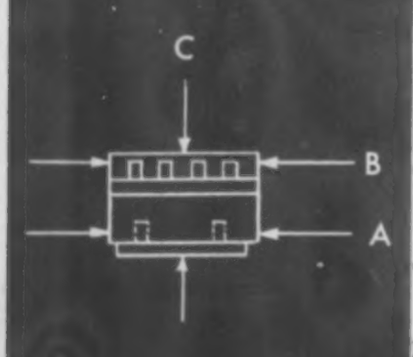
From these tests, the superiority of melamine for this application, from a crack resistant viewpoint, was evident. Consequently, we entered into the second phase of the investigation, which was to determine whether melamine, or possibly some other equally crack-resistant material, was equal to or better than urea in resistance to the wearing action of the silver. wires on the plastic as the armature moved on its pivot.

In this phase of the investigation, the following materials were first tested in a robot under conditions considered to be similar to those encountered in the actual relay:

1. Alpha-cellulose filled urea molding compound.
2. Alpha-cellulose filled melamine molding compound.
3. Mineral filled melamine molding compound.
4. Grade L phenolic laminate.
5. FM-1 nylon.
6. Cellulose nitrate.
7. Wood flour filled phenolic molding compound.

As a result of these tests, materials numbered 1 through 4 were judged considerably better than the other materials. Therefore, moldings of materials 1, 2, and, 3 were made, assembled in relays, and placed in operation. The relays operated at 7200 cycles per min. for test purpose. After 250,000,000 operations, armature brackets molded from both types of melamine were worn so that the relays ceased to operate. The urea brackets performed satisfactorily for 624,000,-

FIG. 6 – Shrinkage in Inches – Armature Bracket Moldings



	Dimension A			Dimension B			Dimension C		
	Before	*After*	*Shrink*	*Before*	*After*	*Shrink*	*Before*	*After*	*Shrink*
Urea—Material X (see Fig. 5) Baked 24 hr. at 150° F.	0.545	0.544	0.001	0.544	0.542	0.002	0.331	0.330	0.001
Baked 48 hr. at 150° F.	0.545	0.542	0.003	0.545	0.541	0.004	0.331	0.330	0.001
Baked 48 hr. at 220° F.	0.545	0.537	0.008	0.545	0.536	0.009	0.331	0.327	0.004
Cellulose filled melamine Baked 48 hr. at 220° F.	0.546	0.541	0.005	0.546	0.538	0.008	0.332	0.329	0.003
Mineral filled melamine Baked 48 hr. at 220° F.	0.547	0.545	0.002	0.547	0.544	0.003	0.333	0.332	0.001

000 operations before any adjustment was required.

Accordingly, the third phase of the investigation—redesign of the part to permit use of the urea material attached to the armature during the molding operation—was begun. The result of this work was the final design (in this case a six-position armature) shown on the right of Fig. 4. Here, the armature bracket molding, of Plaskon 447, is divided into three segments, each actually a separate molding attached to the armature by a single ear centrally located in the molding segment. Since each molding contains only one insert, no cracking occurs because the shrinkage is not restrained. This design obviously conflicts with the original armature design theory that displacement of any metal from the center of the armature (such as shearing out an ear) would affect the performance of the armature adversely. However, tests showed that relays incorporating armatures of this final design operated satisfactorily.

Vibration damper—The last plastic component of the relay to be discussed is the vibration damper, a part whose weight of 0.04 gm. belies the importance of its contribution to the satisfactory performance of the relay. In the operation of the relay, the silver contact wires are flexed away from their normal position when the armature is attracted to the magnet upon its energization. When the magnet is de-energized and the armature released, the flexed wires return to their original position with speed and force sufficient to throw the armature away from the magnet and make the armature rebound at the end of its travel with sufficient energy to cause the contact wires to leave the normal position and create a break in the contacts with the inserts. This bounce, or vibration, must be damped to permit more positive and rapid action of the armature when the magnet is energized and de-energized rapidly.

The original damper was the spring-like assembly (which contained cylindrical metal weights) attached to the armature as shown on the left in Fig. 4. One factor permitting re-design and simplification of the armature assembly as discussed above was the development of an alternate method of damping the vibration of the armature. This was accomplished through the use of a small bumper set in a recess in the frame molding directly under the urea armature bracket molding. Obviously, for this application the "deadest" material would give the most satisfactory results. Several rubber and rubber-like materials were tested, and the material found to possess the lowest energy return characteristic was a vinyl acetate-vinyl chloride copolymer (Vinylite VG 9960 type plastic) of approximately 60 Durometer A hardness. This vibration damper is shown in Fig. 7, as is also the modification in the design of the frame molding to accommodate the bumper.

Migration of plasticizer

Some time after relays incorporating this feature were placed on test, it was noticed that the time for a relay, which had been idle for a short time, to "pick-up" the first time when the coil was energized was considerably longer than the time for the pick-ups immediately following. Specifically, it was determined that the first pick-up time was often as high as 8.5 milliseconds as compared with a normal time of 5.5 milliseconds. After considerable experimentation it was discovered that the cause for this delay in pick-up was sticking of the urea bracket molding to the vinyl bumper against which the urea molding rested when the relay was not energized. Further investigation disclosed that this condition was caused by migration of the plasticizer, which is relatively sticky, to the surface of the bumper.

Although many solutions for this problem were suggested, tests indicated the adequacy of simply roughening the vinyl surface, thereby destroying the continuity of any film of plasticizer that was present. Since this effect could be accomplished by sand-blasting a large number of parts simultaneously in a very short time, this method was chosen as the most economical means of correcting this trouble.

FIG. 7

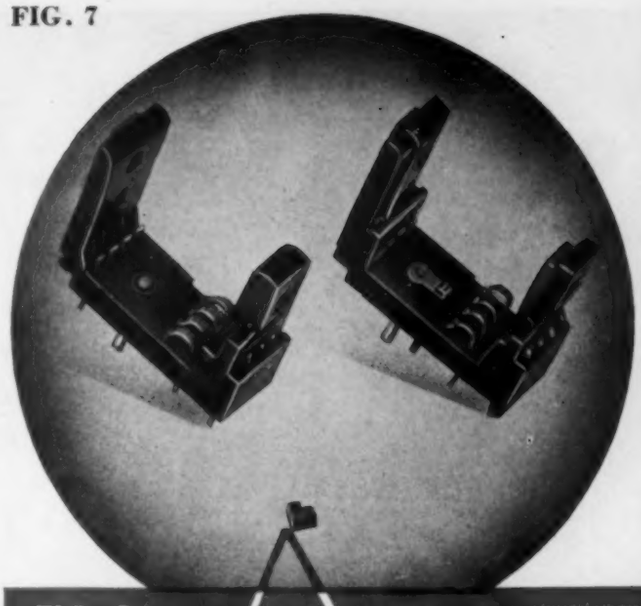
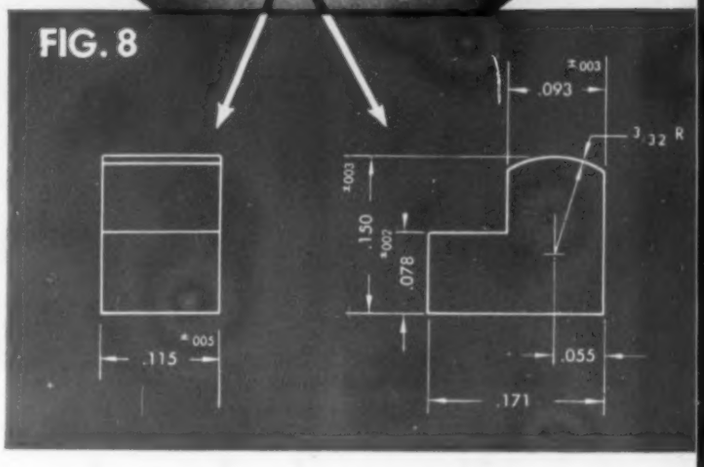
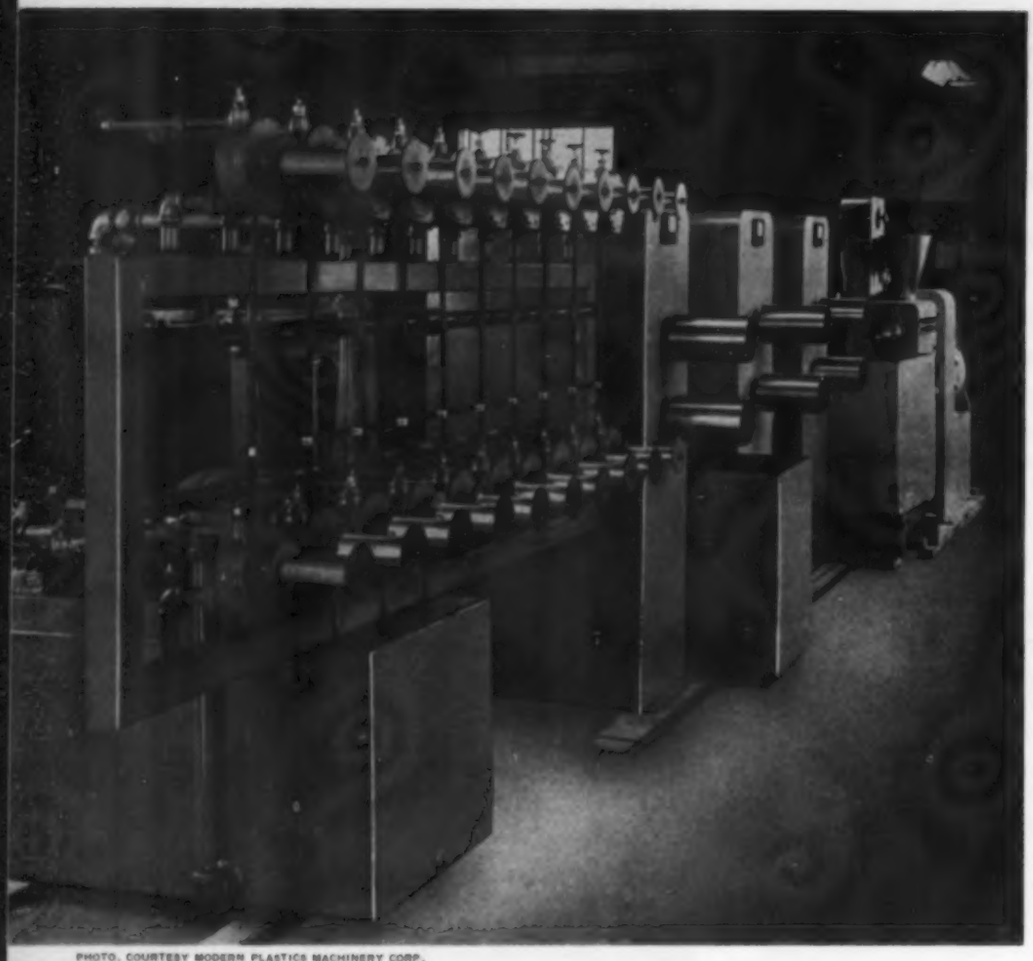


FIG. 8



7—To hold the injection molded vinyl bumper (top center) for damping vibration, frame molding (top left) had to be modified (top right). 8—Drawing of bumper



PHOTO, COURTESY MODERN PLASTICS MACHINERY CORP.

This spooler is hydraulically driven, eliminating friction devices such as springs, washers, etc. A valve on each turbine controls the speed and torque, and can be adjusted to avoid breaking a single monofilament. Traverse is adjustable to move across spool at any desired speed depending upon thread size

Extruded polyethylene filaments

Uniformity of filament diameter must be maintained

and the filaments oriented to gain greatest strength

IN THE extrusion field, plastic monofilaments are gaining more and more importance. So far, their main application has been in window screens, auto seat covers, and exterior or sun porch furniture. However, the market is widening as the diameter of filament decreases through increasing know-how and the use of new types of machinery. At present, 0.008-in. diameter filaments are probably the most popular size but even smaller threads are just around the corner.

Polyethylene, whose manufacturers in this country are the Bakelite Corp. and E. I. du Pont de Nemours & Co., Inc., is a material which is growing in favor as a monofilament. It is weatherproof, flexible at the temperatures encountered in use, has a tensile strength of over 20,000 p.s.i., and is heat stable. It is said to extrude as well as, if not better than, any of the other thermoplastics.

The required equipment includes an extruder, an orientation machine, and an automatic spooling unit.

The extruder is direct electrically heated. However, this unit is jacketed for quick cooling or for the removal of frictional heat. Cylinder zone temperatures are maintained by automatic thermostats, while the die temperature is controlled manually by a voltage regulator, with an indicating thermometer in the die. The 90° head for extruding downward is electrically heated to approximately 450° F., depending on the diameter of filaments to be extruded and the material used. In this discussion, polyethylene is the material considered.

Widely differing tensile strengths are claimed by concerns extruding the material, and by material suppliers' laboratories. The highest tensile claimed by extruder concerns is 35,000 p.s.i. while material suppliers are more conservative. The tensile decreases when the

polyethylene is extruded at over 450° F., according to conservative laboratory technicians.

Clean-outs infrequent

One of the chief advantages in extruding this material is its heat stability. The extruding machine can stand hot for hours without charring the material remaining in the cylinder. When fresh material is fed on restarting the machine, the overheated material is cleaned out with little, if any, difficulty. This feature alone is of paramount importance in that a rise or fall in temperature, due to accident or experimentation, will not stop production by requiring a complete machine clean-out. Moreover, on stopping overnight, or even for a week, the machine need not be cleaned out, but can be started just as soon as extruding temperatures are reached.

The filaments are extruded downward from dies having anywhere from 12 to 20 holes or orifices of 0.023 in. or smaller. The dies are usually made to include an inverted cone to guide the plastic material to the multiple orifices drilled on a circle of approximately $^3/_4$-in. diameter. A die orifice of 0.023-in. diameter will produce a 0.009-in. filament when properly oriented and shrunk before spooling. All holes must be of one diameter to produce uniform threads. When one filament is larger or smaller than the others, it shows up prominently in the woven cloth.

The filaments enter cold water about $1^1/_2$ in. below the die, then pass over a "shoe" or crossbar 10 in. under water to guides, then to the first Godet rolls, at the same diameter they left the die.

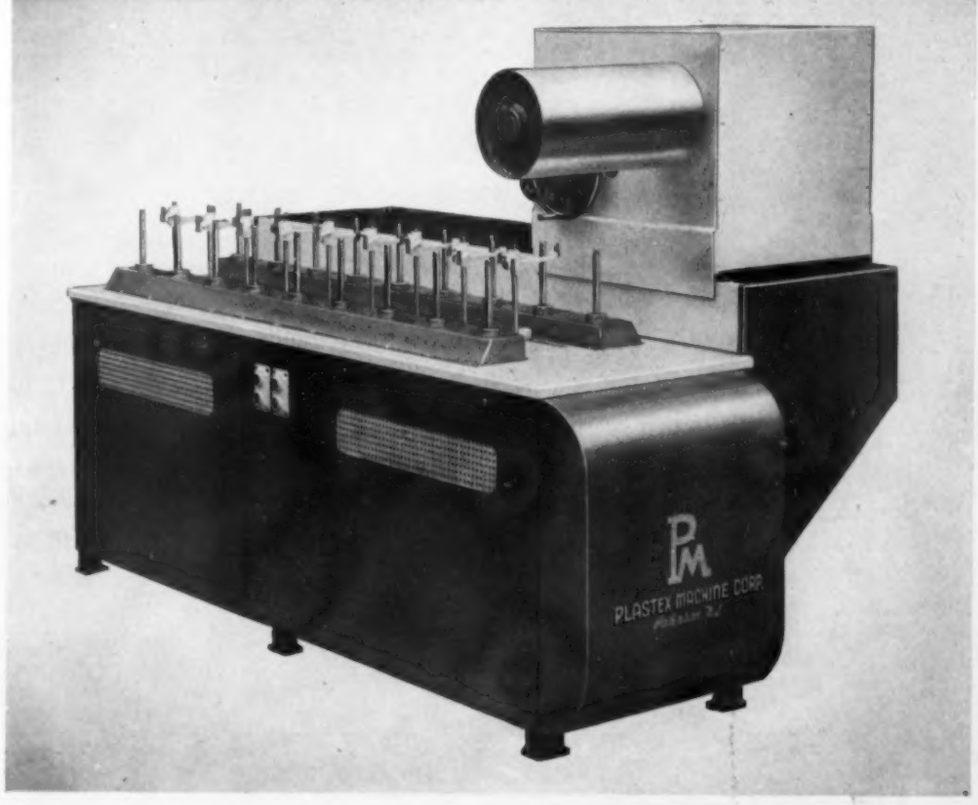
These rolls are made up in pairs with the first top roll horizontal and at 90° to the filaments. The lower rolls are all set at an angle to prevent crossing and to step over the filaments about $^3/_4$ in. each lap around both rolls. After four passes around the first rolls, the filaments proceed to and around the second rolls, traveling at about $6^1/_2$ times the speed of the first roll. This stretches or orients the threads to their strongest point, since the plastic material molecules are drawn out side by side. All of the stretch takes place abruptly as the threads leave the first rolls. After four passes around the second rolls, the filaments enter a hot water bath at 85° C. before reaching the third rolls, traveling approximately 12 percent slower than the second rolls. This relaxes the threads to prevent shrinkage after spooling or weaving.

Spooling of threads

The three-stage orientation machine is arranged so that speed changes of all three stages may be made simultaneously or separately. Any percentage of stretch or shrinkage is provided for. The unit could be used for other materials requiring only two stages and hot or cold water baths can be set before or between any of the rolls.

When properly oriented or annealed, the filaments go directly and collectively to a waste roll. Each thread is then separated and started on spools, one at a time, until all are being spooled. The waste roll is then cleaned off for the next start. When a thread breaks when traveling at high speed, it is spooled on the waste roll until the operator has time to restart it.

PHOTO, COURTESY PLASTEX MACHINE CORP.

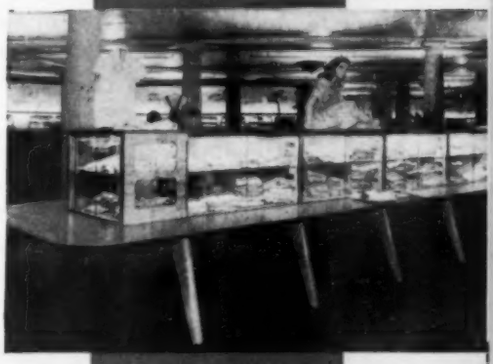


The continuous spooler, shown here, is frictional driven so that each spindle, when spooling, is constantly and automatically controlled in revolution for unvaried uniformity. The traverse throw is also adjustable when necessary

MORE AND MORE the versatility of Plaskon Resin Glue is expanding the use of wood as a construction material. Outstanding examples are the furniture and display cases made by the Grand Rapids Store Equipment Company, Grand Rapids, Michigan.

The permanence of Plaskon Resin Glue has made possible the use of compound curves, and designs which never before were practical with wood and earlier glues. Plaskon Resin Glue is immune to the destructive forces of moisture, dryness, bacteria, fungi and age. It holds plywood, laminated wood, and joined surfaces with a grip so powerful and permanent that warping, splitting, cracking and peeling are eliminated under the most exceptional service conditions.

Famous Glue for Famous Products



DESIGNERS · MANUFACTURERS

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PREFABRICATORS · CONSTRUCTORS

Plaskon Resin Glue is colorless, and will not stain fine veneers. Ease of preparation and handling, freedom from frequent batch mixing, and exceptional standards of finished glued products are other Plaskon Resin Glue features.

Write for free book showing many illustrations of how Plaskon* Resin Glue can be used in the development of new and improved wood products.

*Reg. U. S. Pat. Off.

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★ RESIN GLUE ★

Big new G. E.

AT COSHOCTON, Ohio, a new plant for the production of Textolite laminated plastics was recently opened by General Electric Co. Built for G. E. by the Austin Co., three main buildings for manufacturing purposes have 235,820 sq. ft. of floor space. Other buildings include a power house and a varnish plant.

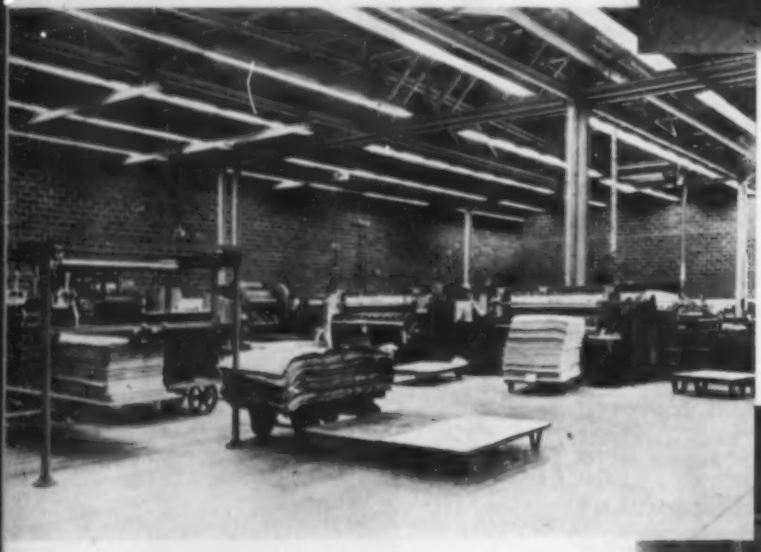
Close control of temperature and humidity by means of air-conditioning and special wall construction, and

PHOTOS 1, 2, 3-4, COURTESY GENERAL ELECTRIC CO.

PHOTOS 1 AND 4, COURTESY THE AUSTIN CO.

1 *The vat room in the new G. E. laminating plant, where resins are blended to produce varnishes for laminating. After the varnishes are prepared, they are pumped to storage tanks, later to be piped along for use in the coating machines*

2 *Take-off end of one of the many big coating machines, which are automatic and continuous in operation. Paper, cloth or glass fabrics are impregnated with laminating varnishes in these machines*



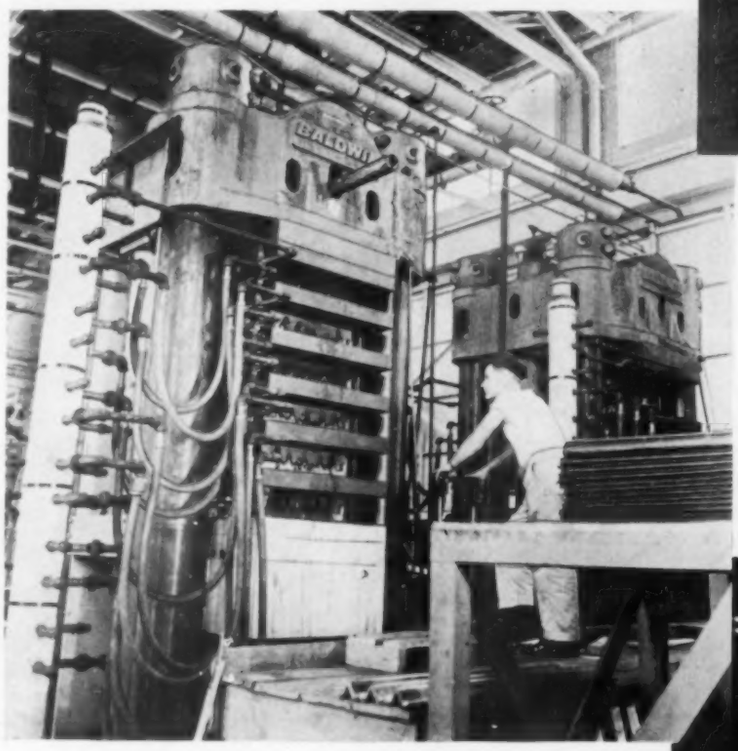
3 *Automatic cutting machines cut up rolls of impregnated paper, cloth, and glass fabric to sheet size, stacking the sheets so they may be built up into layers for laminating. Stacks are then carefully stored*

4 *Light from troffer fluorescent units is reflected from glazed tile wall surfaces to help the staff in the decorative laminates finishing department maintain high control of quality. Air conditioning assures a dust-free operation*

laminating plant

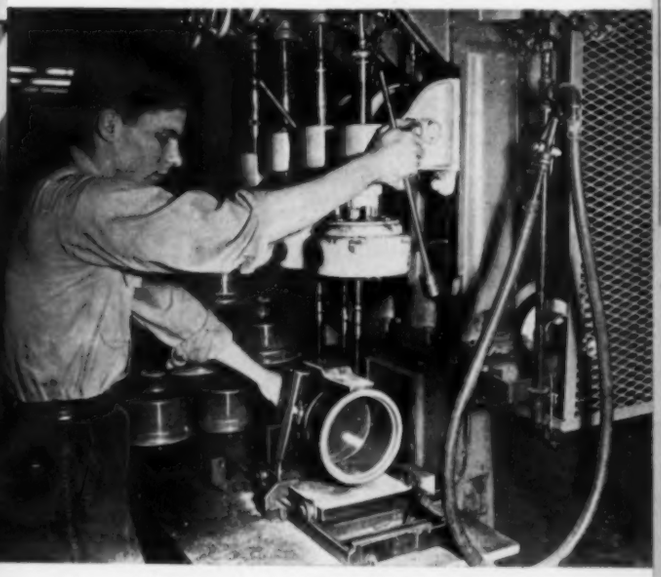
rapid flow of materials through processing are features of the layout. Versatility in type and volume of production is made possible by plug-in electrical bus-bar lines. All chemicals are piped to coating units.

The plant will make everything from bearings, gears, and insulators to decorative sheets 50 by 100 in. or 30 by 110 in. and will handle low pressure work as well as high pressure laminating. Head office of the G. E. Plastics Div. is in Pittsfield, Mass.



5 *This huge press extends 17 feet below floor level. It has a rating of 5000 tons and is served by an elevator. Built-up materials are transferred on big steel carts*

6 *Plies of phenolic-impregnated paper and cloth are molded in the press, which is pictured here, into refrigerator strips by means of the V-shaped platen faces*



7 *Machining a laminated gear blank to make a heavy-duty silent gear. This plant has a complete machine shop for production and maintenance of the many tools which it uses. Some laminates severely punish the cutting edges of tools*

8 *A drilling operation being performed on an acid-resisting rayon spinning bucket. Textile machine applications for high-pressure laminated and molded parts are increasing as the textile industries speed up*

She broiled the steak and barbecued the stove handle

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The right plastic for stove handles not only won't catch fire, it won't even soften or melt in the heat of flaring grease . . . and it provides one of the hardest plastic surfaces known.

If there is a chance . . . even an outside chance . . . that a plastic product or part will be exposed to flame and heat and might be cleaned with solvents . . . and if brilliant, pastel, ivory or white colors are desired . . . MELMAC® or BEETLE® *thermosetting* plastics probably should be used.

Remember this . . . *no one plastic serves all plastic needs* . . . no more than any one metal meets all metal requirements. So, when buying, selling or making plastic products or parts request information that will assure you they are soundly designed in the plastic best suited for the jobs they must do.

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These two plastic stove handles look exactly alike. The difference is that one is made of the right plastic properly designed and applied. To make sure of long service, look for informative labelling or ask for the facts about the plastic products you buy.

QUESTIONS PLEASE! Our technical staff will be glad to help you solve problems in plastic application and design. And if our materials do not fill the bill exactly, we will cheerfully direct you to the right sources. American Cyanamid Company, Plastics Division, 32 Rockefeller Plaza, New York 20, N. Y.

BEETLE® plastics—urea-formaldehyde thermosetting molding compounds. MELMAC® plastics—melamine-formaldehyde thermosetting molding compounds, industrial and laminating resins. URAC® resins—urea-formaldehyde thermosetting industrial resins and adhesives. MELURAC® resins—melamine-urea-formaldehyde thermosetting adhesive and laminating resins. LAMINAC® resins—thermosetting polyester resins.
®Reg. U. S. Pat. Off.

Cyanamid
Plastics

DIVISION OF AMERICAN CYANAMID COMPANY

How Many Kinds of Plastics Are There?

In the long run, there should only be one kind of plastic material: the *right* plastic for each individual application.

This is the theme of a new series of advertising messages sponsored by the Plastics Division of American Cyanamid Company. (The second of this new series is reproduced on the opposite page.)

Thus, in addition to promoting our own materials, we are encouraging retailers and manufacturers of finished parts to exercise discrimination in the purchase and use of plastic materials. Through monthly insertions in such publications as TIME, DEPARTMENT STORE ECONOMIST, and CHAIN STORE AGE we are pointing out to manufacturers and retailers that *no one plastic serves all plastic needs . . .* and that they should be *aware* of the differences in plastics.

For, as we all know, a good plastic is NOT *a good plastic when wrongly applied.*

AMERICAN CYANAMID COMPANY, Plastics Division
32 Rockefeller Plaza, New York 20, N. Y.

NOTE: As a result of increased production facilities and the securing of additional raw materials, it is no longer necessary for us to allocate BEETLE molding compounds.

Production coating under high vacuum

DURING THE war, the development and use of high vacuum technology in many fields made giant strides. One of the most important forward steps was that of coating lenses and prisms for use in binoculars, range finders, and bomb sights.

Greatly improved transmission of light was found to result from thermal evaporation of metallic salts onto these optical elements under high vacuum. Similar techniques have been developed for producing front surface mirrors and decorative novelties by evaporating aluminum, gold, silver, and other metals on to plastics, paper, cloth, or glass.

Automatic coating machine

For such work, the National Research Corp., Cambridge 42, Mass., has introduced an automatic machine in which materials can be continually processed at high vacuum pressures ranging below 10^{5} mm. Hg, or $^{1}/_{100}$ millionth of an atmosphere.

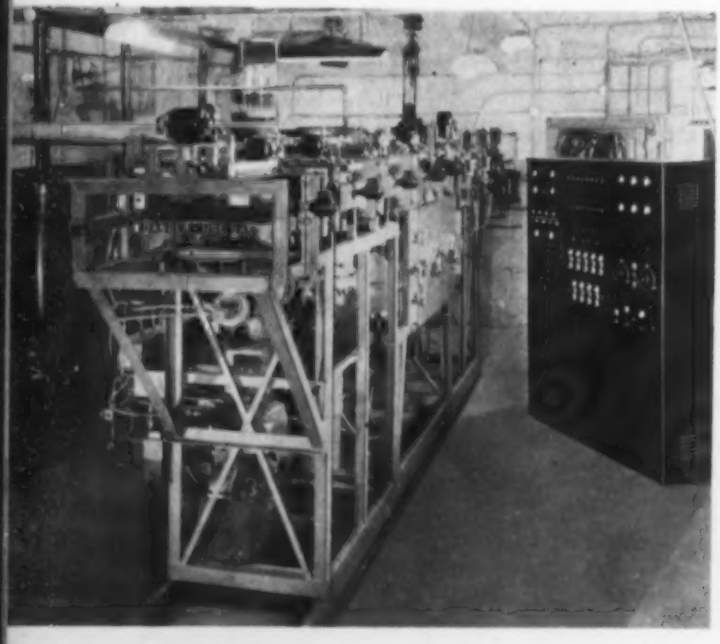
Until now, efficiency of such operations has been impaired for they had to run on a batch basis. This meant considerable loss of time while the operator placed each group of objects in the vacuum chamber, pumped it down, and performed the coating operation.

With this new coating machine, a 2-ft. sq. aluminized front surface mirror can be produced in 1 min. compared with 15 min. to an hour previously required. The unit itself is about 40 ft. long and weighs 10 tons.

The material to be coated is held in a tray which is placed in a conveyor. It then proceeds automatically through a series of cells or locks until it emerges at the opposite end of the conveyor as a finished piece. The first cell is evacuated to about 0.3 mm. Hg absolute. By means of very high speed diffusion pumps, the pressure in the second cell is reduced to approximately 0.0001 mm.

The processing takes place in the next chamber after which the completed piece proceeds out to the atmosphere through a lock system reversing the entrance sequence. The air lock doors are operated hydraulically and the sequence of operation is controlled through electrical interlocks and relays. Motion is imparted to the trays from an intermittently operating chain in each cell that engages the trays.

Material passes through a series of cells or locks of this new coating machine, emerges as finished piece



Cell size limited

Several technical features make this automatic type of machine of particular interest. The processing chamber is under vacuum continuously, and the high vacuum pump-down cells do not go to a high pressure that will produce subsequent evolution of gas from the metal walls. The total quantity of air that must be pumped per piece is greatly reduced by making the cells just large enough to hold the desired objects. There is the further advantage that the flow of materials becomes nearly continuous by using a fast cycle.

Some "musts" for use of unit

Several considerations must be kept in mind for successful use of this machine. First, production demands must be relatively high in terms of total units. Second, a high use factor must be assured. Third, the objects for any one machine must be nearly identical.

It is also desirable that the processing under high vacuum can be made to take place within the time of a few cycles so that the middle chamber cycle does not become excessively long. Once the requirements are satisfied, very large savings may be made in unit cost and high vacuum processing may be said to be truly out of the laboratory.

While the progress of only one unit through the machine has been described above, in actual operation, the pieces follow each other so that a maximum number of cells are loaded all the time consistent with smooth operation.

Other high vacuum work

National Research Corp. has made other contributions to the development of high vacuum technique, particularly in the dehydration of penicillin, blood plasma and other pharmaceuticals. It is also continuing its metallurgical activities and is developing the vacuum processes for the production of gas-free metals.

3 REASONS WHY BARRETT IS A BASIC NAME IN PLASTICS

1

DIBUTYL PHTHALATE. Liquid. Excellent color and low odor. Soluble or miscible with common organic solvents and diluents but practically insoluble in water. Compatible with most lacquer resins, and has high plasticizing efficiency for nitrocellulose. Widely used for nitrocellulose lacquers and cements, synthetic rubber and resins.

2

DICYCLOHEXYL PHTHALATE. White crystalline powder. Used in unsupported vinyl films (for luggage, wall covering, shoes, upholstery, etc.) to which it imparts a hard, glossy surface with a firm hand. High solvency and excellent fluxing action at processing temperatures help eliminate calendering difficulties. Has superior properties with regard to water and oil absorption, and has very low volatility. Extruded products plasticized with dicyclohexyl phthalate are easily processed at operating temperatures yet possess toughness at room temperature.

3

PLASTICIZER 50B. Liquid. Excellent color. Highly compatible with vinyl resins, and used in both supported and unsupported vinyl sheeting and extruded vinyl products. Films plasticized with 50B possess low temperature flexibility, very soft hand at room temperature, good light and heat stability, transparency and lustre, and good resistance to water absorption and extraction by mineral oil. An excellent solvent for vinyl resins which provides good wetting action during processing.

Barrett*

*Reg. U. S. Pat. Off.

THE BARRETT DIVISION
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ONE OF AMERICA'S GREAT BASIC BUSINESSES

CLAREMONT

Flock-filled Phenolic Adapter Rings Solve Motor Bearing Problem*

*The complete story of this achievement appears, as an editorial feature, in the July 1947 Modern Plastics (P. 84).

Photo Courtesy of Durez Plastics & Chemicals, Inc.

...medium-impact flock-filled material proves superior to woodflour more economical than steel!

For integrally molding these adapter rings and bearings, a woodflour-filled Durez material was first specified, but having a long flowing period the formulation resisted control, deformed the bearing. Now, a medium-impact Claremont Flock-filled Durez Plastic, with relatively short flow time, is being used most successfully. Large numbers of these adapters, put into the field, have established excellent service records.

Laboratory test quantities of all four types of strength-giving Claremont Fillers (Flock, Thread, Fabric, Cord) are available to you upon request. Inquiries invited!

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FLOCK
THREAD
FABRIC
CORD

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WASTE MANUFACTURING CO.

"The Country's Largest Manufacturer of Flock" CLAREMONT, N. H.

Manufacture, compounding, and uses of polystyrene in Germany*

BULK polymerization is carried out without catalyst in a tower (Fig. 2) constructed internally of V2A stainless steel. The tower is divided into six sections, each of which is separately heated. The first section has no steam coil, the next four have both steam jackets and internal coils, and the sixth (the lowest) is heated electrically. The outlet from the tower is also heated electrically and the material is extruded by a screw feed, electrically heated and driven by a variable speed motor. The extrusion screw forces the polymer through a die which delivers the product in the form of ribbons about 4 mm. thick, 30 to 40 mm. wide and 8 m. long.

When a low-molecular-weight polystyrene is required, the monomer is fed directly to the tower. The first two sections are heated to 100° C. with steam. Steam pressure at 3 to 4 atmospheres (150° C.) is used in the jacket of the third section, and in the lowest steam-jacketed sections the steam pressure is 10 atmospheres (180° C.). The electric heater at the aperture gives a final product temperature of 220° C.

Monomeric styrene is passed in to fill the tower to the top of the second section (1200 kg.) and then admitted at the rate of 40 kg. per hour. The column is heated and the material polymerizes. The polystyrene ribbon is fed on to an endless steel band, driven by a variable speed motor. On this band the polymer passes under four water-cooled rollers and is finally broken up by revolving knives. These particles are passed to a mill which produces granules of 2 to 3 mm. diameter. This process gives a material with a K-value of 58 to 60 (M.W. 50,000) and is used only for varnishes. It is called Polystyrol L.

For injection molding it is necessary to increase the K-value. This is done by a process of prepolymerization. The prepolymerization is done in aluminum kettles fitted with Silumin lids and stirrers (Fig. 2). The kettles have internal coils which can be used for heating or cooling. Heating is done by circulating hot water. It is usually 4° lower than styrene mix.

The stirrers are fitted with two stuffing boxes through which a current of nitrogen passes. This serves the dual purpose of keeping the glands free from styrene, which would wash out the lubricating oil, and also excluding oxygen from the vessel. The vessel is charged with 1200 kg. monomer and heated to 76 to 78° C. For continuous operation the rate of addition is 22 kg. per hour. Initial prepolymerization takes approximately two days and the polymer contains 35 to 36 percent polystyrene (determined by refractive index). The prepolymer is then fed to the main polymerization tower. Polystyrol III, made by this process[1] has a K-value of 70 to 72 (M.W. 120,000).

The polymer made in the prepolymerization plant as a 35 percent solution in monomer is sometimes separated for use in injection molding. The solution is fed to an Escher-Wyss-Walzen drier. This drier consists of mixing rolls running in an evacuated chamber. The chamber is fitted with a condenser and barometric leg of sufficient height to compensate for the vacuum in the drier (15 to 20 mm). The rolls are

* "Investigation of German plastics plants," by G. M. Kline, J. H. Rooney, J. W. C. Crawford, T. Love, and F. J. Curtis. PB 949.

[1] Another report indicates that 0.02 percent glacial acetic acid is added to the styrene charge in making Polystyrol III to reduce the final volatile content to less than 0.5 percent which, without acid, runs more than 1 percent. See "German plastics practices," by J. M. DeBell, W. C. Goggin, and W. E. Gloor. PB 12467.

1—*Styrol Strasse in I. G. Ludwigshafen plant, VE day*

heated with steam to 76 to 80° C. Monomeric styrene distills off. A sheet of polystyrene is formed on both rolls, is cut off, and discharged into a container heated at 60° C. under vacuum. The time of drying on the rolls is 15 seconds. The container under vacuum is discharged by nitrogen for convenience. The product formed is free from monomer and has a molecular weight of 450,000. It is known as Polystyrol IV.

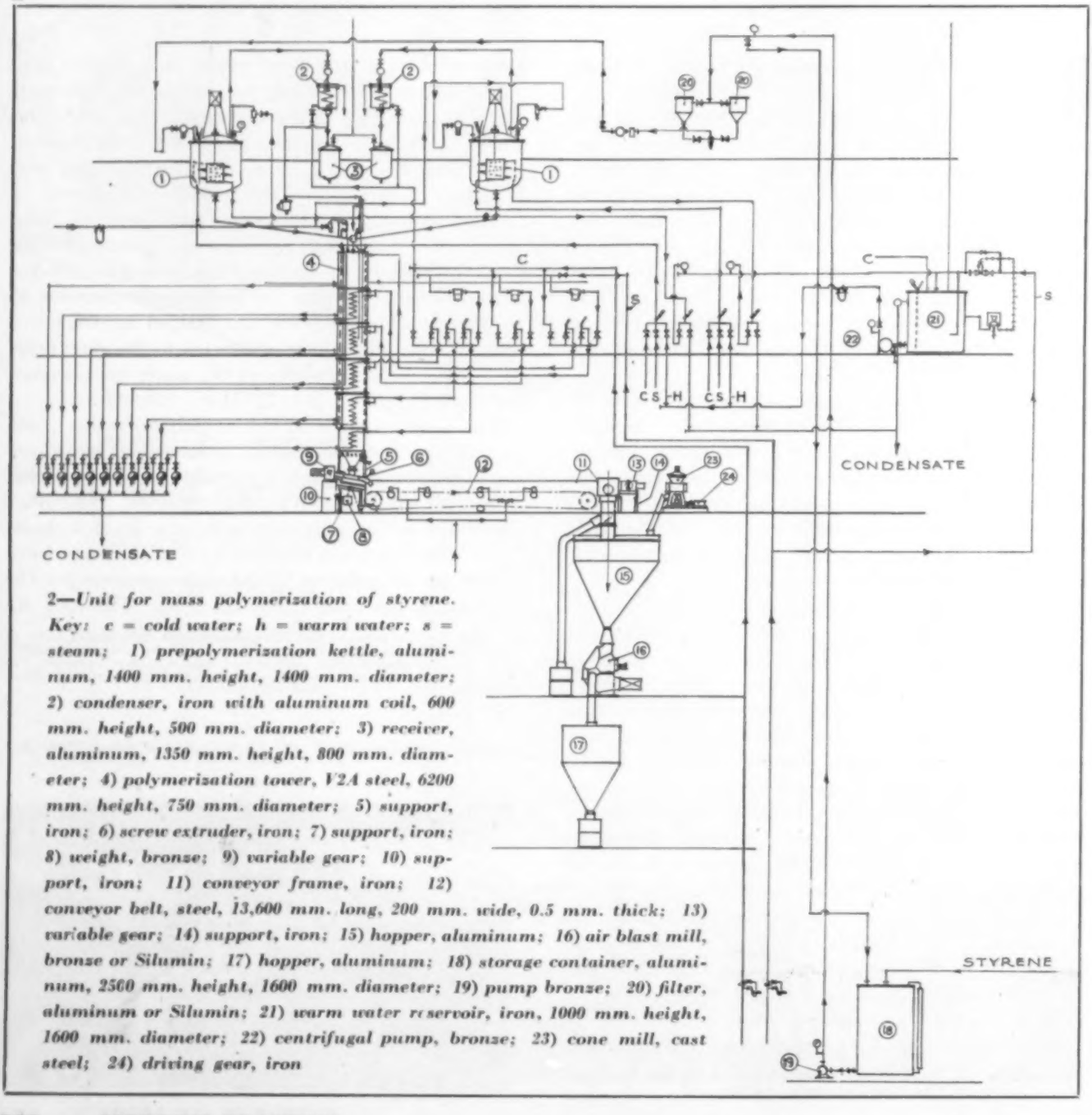
Emulsion polymerization

Emulsion polymers are made in water using potassium persulfate as a catalyst, 1 percent soap as emulsifier, and 0.5 percent sodium dihydrogen phosphate as a pH regulator. For special electrical purposes the polymer is prepared with hydrogen peroxide which does not remain in the final product.

Polystyrol EF—The formulation for making this polymer is as follows: 2000 kg. styrene; 20 kg. Amphoseife 18 (sodium salt of oxyoctadecane sulfonic acid; calc. as 100 percent); 2 kg. potassium persulfate; 70 kg. sodium dihydrogen phosphate (14 percent solution); remainder water for 30 percent dispersion.

The pH of the mixture should be in the range 8 to 9; this is regulated by the sodium dihydrogen phosphate. The entire batch is mixed, stirred, and maintained at 70° C. for 2 hours. The temperature is then raised to 90° C. over a period of $1^1/_4$ hr. and traces of monomer are removed by blowing a stream of nitrogen over the surface. The dispersion is passed to drying rolls of the Escher-Wyss-Walzen type operated without vacuum. Rolling is continued until the polymer is free from monomer. Temperatures up to 160° C. are used.

2



2—Unit for mass polymerization of styrene. Key: c = cold water; h = warm water; s = steam; 1) prepolymerization kettle, aluminum, 1400 mm. height, 1400 mm. diameter; 2) condenser, iron with aluminum coil, 600 mm. height, 500 mm. diameter; 3) receiver, aluminum, 1350 mm. height, 800 mm. diameter; 4) polymerization tower, V2A steel, 6200 mm. height, 750 mm. diameter; 5) support, iron; 6) screw extruder, iron; 7) support, iron; 8) weight, bronze; 9) variable gear; 10) support, iron; 11) conveyor frame, iron; 12) conveyor belt, steel, 13,600 mm. long, 200 mm. wide, 0.5 mm. thick; 13) variable gear; 14) support, iron; 15) hopper, aluminum; 16) air blast mill, bronze or Silumin; 17) hopper, aluminum; 18) storage container, aluminum, 2500 mm. height, 1600 mm. diameter; 19) pump bronze; 20) filter, aluminum or Silumin; 21) warm water reservoir, iron, 1000 mm. height, 1600 mm. diameter; 22) centrifugal pump, bronze; 23) cone mill, cast steel; 24) driving gear, iron

The dispersion may also be coagulated by electrolytes or formic acid.

The K-value of the product is 125 to 130 (M.W. 600,000 to 700,000). Still higher molecular weight products are said to be produced by adding 0.1 percent divinylbenzene to the styrene during polymerization. With divinylbenzene the K-value is 145, which is claimed to correspond to a molecular weight of approximately 1,000,000.

Polystyrol EF is used for injection molding (95 percent of output). It is sometimes employed as an emulsion for sizing papers.

Polystyrol EN—This copolymer is made in the same manner as Polystyrol EF, using 70 percent styrene and 30 percent acrylonitrile. The K-value is 100 to 110 which corresponds approximately to a molecular weight of 600,000. It is soluble only in such liquids as tetrahydrofuran. It is used for printing type.

Polystyrol EH—This is a copolymer made with 25 parts vinyl carbazole, 25 parts acrylonitrile, and 50 parts styrene. The process is essentially the same as for Polystyrol EF. The vinyl carbazole is dissolved in styrene and acrylonitrile and then added to the water. It is dried at 160° C. Polystyrol EH has a high softening point and does not shrink in boiling water. The K-value is 100 to 105 (M.W. 500,000). It is soluble in tetrahydrofuran. Polystyrol EH is also used for printing type. Polystyrol EH and EN are not used in emulsion form.

Polystyrol B—This is a solution made from 70 parts styrene and 30 parts isobutyl acrylate. The solution in 100 parts ethylbenzene is heated under reflux at 140° C. for 40 hr. and the ethylbenzene is distilled off. Polystyrol B is used for varnishes. The output was 100 kg. per month.

Processing of polystyrene[2,3]

Most of the polystyrene made at Ludwigshafen and Schopau was sold to Dynamit A.G., Troisdorf, for processing into injection molding compounds. The latter were marketed under the trade name, Trolitul.

[2] "Investigation of German plastics plants, Part IV," by J. W. C. Crawford and T. Love. PB 34032.

[3] "Miscellaneous chemical processes and plastics machinery," by E. W. Halbach. PB 34808.

Table I.—Data on Styrene Polymers Made at Ludwigshafen

Type	*Composition*		*1942 Production*	*Cost*	*Selling price*
			tons	*RM/kg.*	*RM/kg.*
...	Styrene		4671	0.85	3.40
III	Polystyrene		4363	1.05	2.50
IV	Polystyrene		74	1.21	4.20
EF	Polystyrene		276	1.82	...
EN	Styrene	70	2	1.88	...
	Acrylonitrile	30			
EH	Styrene	50	...	...	...
	Acrylonitrile	25			
	Vinyl carbazole	25			
B	Styrene	70	9	1.42	4.40
	Isobutyl acrylate	30			
L	Styrene	95	158	1.00	3.00
	Toluene	5			

The capacity at Troisdorf was 150 to 200 tons per month of colors and 50 to 100 tons per month of clear Trolitul III molding compound. This type was preferred because of ease of molding. Trolitul EF yields a tougher molded product although requiring a higher molding temperature and being less clear; 60 to 70 tons per month of this compound were used for molding mortar fuse parts. Trolitul IV was made only during the war; it is slightly more difficult to work than Trolitul III and has no special advantages.

The compounding of polystyrene for injection molding consists essentially of incorporating coloring material. This is done at Dynamit A.G. on mixing rolls 1000 mm. long and 400 mm. in diameter. One roll runs at 20 r.p.m. and the other at 15 r.p.m. The temperature of the rolls and output for the different types of polystyrene varies as follows:

Type	*Temperature of rolls*	*Output per set of rolls*
	° C.	*tons/month*
III and IV	110	22–25
EF	150–160	18–20

The polymer for Ludwigshafen is passed over a magnetic separator and then hand-inspected on a moving belt by girls. For black material the color is premixed in a ball mill (*Please turn to page 210*)

Table II.—Properties of Various Types of Polystyrene Molding Compounds (Trolituls)

	III	IV	EF	EN	EH	Si 4
True color	*Colorless*	*Colorless*	*Weakly yellow, transparent*	*Strongly yellow, transparent*	*Strongly yellow, transparent*	*Grey*
Specific gravity	1.05	1.05	1.05	1.08	1.10	1.18
Bending strength,* kg./sq. cm.	800	900	1000	1200	1300	800
Impact resistance,* cm.-kg./sq. cm.	20	25	30	30	30	15
Heat resistance						
Martens, ° C.	65–70	70–75	70–75	80–85	90–95	70–75
Vicat, ° C.	90	100	105	110	115	85
Ball indentation hardness, kg./sq. cm.	1200	1200	1200	1200	1300	1200
Dielectric constant	2.3	2.3	2.3	2.8	2.8	3.2
Dielectric loss factor (tan δ)	0.0002	0.0002	0.0002	0.001	0.001	0.001
Water absorption	0	0	0	0	0	0
Injection molding temp., ° C.	170	175	180–200	210–220	220–230	...

*Small specimens.

Organic peroxides—properties and uses

by REGINALD P. PERRY and KENNETH P. SELTZER*

Summary

The manufacture, properties, and some commercially important uses of five novel organic peroxides are described. They are unusually stable under normal conditions, and have become valuable tools to the rubber and plastics industry because of their unique properties. In bulk and emulsion polymerization reactions they are found to give more rapid reaction rates and different polymer characteristics from those obtained with previously known peroxide catalysts. They are effective catalysts for the curing of modified polyester resins, and in conjunction with certain chemical activators greatly accelerated gel times are observed. The same chemical reactions used for the manufacture of these five will give many peroxides of different structure and properties. Such permutations will in time lead to the commercial availability of a wide range of *tailored* peroxides designed to the specific needs of industry.

IN RECENT YEARS, a series of novel and unusually stable organic peroxides have been developed and are now available to industry. They are finding increasing use in many fields, particularly in rubber and plastics. All but one of these peroxides presently supplied contain the tertiary butyl group. They differ distinctly, however, in their physical properties and ultimate effect produced by them in various reactions.

Although a large number of permutations of these compounds have been made and studied in the laboratory, production is limited at present to five products of proved commercial value: *t*-butyl hydroperoxide, di-*t*-butyl peroxide, *t*-butyl perbenzoate, di-*t*-butyl diperphthalate and 1-hydroxycyclohexyl hydroperoxide-1. These may be classified as tertiary alkyl and di-tertiary alkyl peroxides, tertiary alkyl and di-tertiary alkyl peresters, and hydroxyhydroperoxides.

A great deal of interesting work has been done on the properties and structure of these compounds,[1] and their effects as catalysts in polymerization reactions, which indicate much promise in industrial applications. For example, the reaction products of some of them with alkaline earth bases may be valuable as intermediates in industrial syntheses. Furthermore, recent literature[2] indicates the use of peroxides as catalysts in the low-temperature halogenation of saturated hydrocarbons and the reversal of Markownikoff's rule in their presence. These novel peroxides may be of value in this

* Union Bay State Chemical Co.

[1] "Studies in organic peroxides, V. *t*-Butyl hydroperoxide," by Nicholas A. Milas and S. Arthur Harris, J. Am. Chem. Soc. *60*, 2434 (1938). "Studies in organic peroxides, VI. Cyclone peroxides," by Nicholas A. Milas, S. Arthur Harris and Paul C. Panagiotakos, ibid. *61*, 2430 (1939). "Studies in organic peroxides, VIII. *t*-Butyl hydroperoxide and di-*t*-butyl peroxide," by Nicholas A. Milas and Douglas M. Surgenor, ibid. *68*, 205 (1946). "Studies in organic peroxides IX. *t*-Butyl peresters," by Nicholas A. Milas and Douglas M. Surgenor, ibid. *68*, 642 (1946). "The synthesis and thermal decomposition of di-triethylmethyl, *t*-butyl pentamethylethyl and *t*-butyl 1-methylcyclohexyl-1 peroxides," by Nicholas A. Milas and Lloyd H. Perry, ibid. *68*, 1938 (1946). "Studies in organic peroxides, XII. Molecular refractivity and the structure of organic peroxides," by Nicholas A. Milas, Douglas M. Surgenor and Lloyd H. Perry, ibid. *68*, 1617 (1946).

[2] "Chlorinations with sulfuryl chloride, I. The peroxide-catalyzed chlorination of hydrocarbons," by M. S. Kharasch and Herbert C. Brown, J. Am. Chem. Soc. *61*, 2142 (1939).

Table I.—Physical Properties of Some Organic Peroxides

Properties	t-*Butyl hydroperoxide (pure)*	t-*Butyl hydroperoxide (60 percent)*	*di*-t-*Butyl peroxide*	t-*Butyl perbenzoate*	*di*-t-*Butyl diperphthalate*	*1-Hydroxy-cyclohexyl hydroperoxide-1*
Appearance	Clear, colorless, liquid	Clear, colorless, liquid	Clear, colorless, liquid	Clear, slightly straw colored, liquid	White, crystalline, solid	White, crystalline, solid
Odor	Sweet, sharp	Sweet, sharp	Sweet, ethereal	Pungent, aromatic	...	...
Molecular weight	90.12	...	146.226	194.22	310.78	132.096
Available oxygen, %	17.78	10.66	10.95	8.24	10.29	12.13
Density, d_4^{20}	0.896	0.860	0.793	1.043	...	...
Refractive index, n_D^{20}	1.4013	1.3962	1.3872	1.5007	...	...
Boiling point, ° C.	4.5–5	...	12–13	75–77	...	...
Boiling point, mm.	2	...	20	2	...	...
Melting point, ° C.	3.8–4.8	−35 to −36	−18	...	57–57.5	76–78
Flashpoint, ° C.	...	18.3	18	25.5	...	...
Solubility	Most aromatics and aliphatics, 12% in water	Most aromatics and aliphatics, 11% in water	Most aromatics and aliphatics, insoluble in water	Most aromatics and aliphatics, insoluble in water	Most aromatics and aliphatics, insoluble in water	Most aromatics and aliphatics, about 0.4% in water

connection. Di-*t*-butyl peroxide has been used as an additive to Diesel fuels, raising the cetane number considerably. In addition, results of several investigations indicate that *t*-butyl hydroperoxide possesses bactericidal properties of interest to the pharmaceutical industry.

Manufacture

The *t*-butyl hydroperoxide is produced through the treatment of *t*-butyl alcohol or isobutylene with sulfuric acid, followed by reaction with hydrogen peroxide.[3]

Since, in this process, di-*t*-butyl peroxide is normally formed simultaneously to the extent of about 40 percent, it is presumed to be formed by reaction of some *t*-butyl hydroperoxide with *t*-butyl sulfate, both being present in the reaction mixture. As a matter of fact, when the operating conditions are changed but slightly, one can produce almost entirely the di-*t*-butyl peroxide to the exclusion of *t*-butyl hydroperoxide. However, it has not yet been possible completely to prevent formation of the di-form to prepare 100 percent of hydroperoxide.

t-Butyl perbenzoate and di-*t*-butyl diperphthalate, termed "peresters," are essentially derivatives of an organic acid and a hydroperoxide.[4] These two peroxides are produced by use of a modified Schotten-Baumann reaction, with either the acyl chloride or the anhydride.[5] 1-Hydroxycyclohexyl hydroperoxide-1 is synthesized from cyclohexanone.[6]

Although the preparation of these products in the laboratory presents no unusual difficulties, save possibly in the determination of those optimum reaction conditions which will result in maximum product yield, large-scale production offers many more serious problems. Chief among these is the need for suitable equipment (reactors, pumps, piping, etc.) which will withstand the strong corrosive and oxidizing action of the chemical reactants involved. Special alloys are necessary in some equipment, although glass and ceramics may be used wherever possible. Because optimum reaction temperatures are of the order of 0° C. and the heats of reaction are considerable, special attention must be given to the problems of heat transfer and refrigeration. Since, for the most part, two-phase systems of organic liquid over water or organic solid in water are obtained in the final stages of reaction, the separation and purification of the end-product is a relatively simple mechanical process, although time consumed results in high labor costs due to many unit operations.

Physical properties

The physical properties of these peroxides are shown in Table I. The *t*-butyl hydroperoxide (60 percent) listed in the second column is a mixture of 60 percent by weight of *t*-butyl hydroperoxide and 40 percent of di-*t*-butyl peroxide, the average proportions obtained in commercial preparation. No separation of the components is normally undertaken since this mixture has been found quite suitable for most applications. It is possible, however, to separate the mixture either by distillation[7] or by taking advantage of the reactivity of *t*-butyl hydroperoxide with alkalies and the consequent solubility of the alkaline metal salt in water.

t-Butyl hydroperoxide, di-*t*-butyl peroxide, and *t*-butyl perbenzoate, being liquids, are soluble in or miscible with most monomers or polymerizable bases. This is of advantage in compounding, since they may be added on a weight or volume basis without loss and consequent variation in result. Although 1-hydroxycyclohexyl hydroperoxide-1 and di-*t*-butyl diperphthalate are soluble in most monomers, they will generally require longer mixing to insure complete solution.

These peroxides are all inherently quite stable when exposed to normal aging conditions. For example, *t*-butyl hydroperoxide, assayed initially and after one year of shelf storage at room temperature, showed decreases of not more than 0.2 percent available oxygen. In the presence of most metals, decomposition occurs at varying rates, lead being particularly active in this respect. In addition, most organic and inorganic reducing agents have a pronounced effect upon these peroxides; however, they are surprisingly stable in the presence of alkalies and acids.

The *t*-butyl hydroperoxide and perbenzoate are relatively more stable than the other types, the greatest hazard involved being due to their flammability. The unusual stability of these products is shown by sensitivity measurements determined by a drop-weight method. Samples were placed on a steel anvil, covered with a 1430-gram soft steel plunger, and a steel weight (4.25 kg.) dropped onto the plunger from varying heights. Data in Table II show lowest point at which instantaneous decomposition occurs in 50 percent of trials.[8]

The temperature at which decomposition of these peroxides will occur is also a measure of their stability. The observations shown in Table III were made in a

Table II.—Impact Sensitivity of Some Organic Peroxides

Peroxide	*Height required for explosion*	
	At 26° C.	*At −5° C.*
	cm.	*cm.*
Benzoyl peroxide	39	130
1-Hydroxycyclohexyl hydroperoxide-1	59	...
di-*t*-Butyl diperphthalate	65	...
t-Butyl perbenzoate	...	130

Table III.—Thermal Decomposition Temperature of Some Organic Peroxides

Peroxide	*Thermal decomposition temperature*
	° C.
1-Hydroxycyclohexyl hydroperoxide-1	71
t-Butyl hydroperoxide (60%)	89
Benzoyl peroxide	99
di-*t*-Butyl diperphthalate	108
t-Butyl perbenzoate	116
di-*t*-Butyl peroxide	(boils)

[3] Milas, U. S. Patents 2,223,807 (Dec. 3, 1940); 2,176,407 (Oct. 17, 1939).
[4] "Studies in organic peroxides, IX. *t*-Butyl peresters," by Nicholas A. Milas and Douglas M. Surgenor, J. Am. Chem. Soc. *68*, 642 (1946).
[5] Patents pending.
[6] Milas, U. S. Patent 2,298,405 (Oct. 13, 1942).
[7] Rust, U. S. Patent 2,383,919 (Aug. 28, 1945).
[8] L. H. Perry, Mass. Inst. of Technology, Ph.D. Thesis (1946), pp. 33–4.

Table IV.—Effect of Various Peroxides on the Initial Gelation of Some Commercial Low Pressure Laminating Resins

Resin	*Cure temp.*	*Peroxide*	*Observed gel time*		
			0.1% Peroxide	*0.5% Peroxide*	*1.0% Peroxide*
	° C.		*min.*	*min.*	*min.*
Laminac 4125	50	1-Hydroxycyclohexyl hydroperoxide-1	28	6	5
		Remainder of this group	...	...	>75
		Benzoyl peroxide		...	>55
Selectron 5003	50	*t*-Butyl hydroperoxide 60 percent	14	9	6
		1-Hydroxycyclohexyl hydroperoxide-1	30	11	10
		t-Butyl perbenzoate	57	28	11
		di-*t*-Butyl diperphthalate	61	48	38
		di-*t*-Butyl peroxide	...	>90	68
		Benzoyl peroxide	...	>70	58
Vibrin 103	50	1-Hydroxycyclohexyl hydroperoxide-1	67	20	19
		di-*t*-Butyl diperphthalate	80	29	24
		t-Butyl hydroperoxide	89	64	69
		di-*t*-Butyl peroxide	>100	78	47
		t-Butyl perbenzoate	>100	96	93
		Benzoyl peroxide	70	38	28
Allymer CR-39	100	*t*-Butyl perbenzoate	>180	125	91
		Remainder of this group	...	...	>180

study of decomposition temperatures of five peroxides, comparing them to benzoyl peroxide as standard.[9]

Effect in polymerization reactions

Our investigation of the activity of the *t*-alkyl peroxides and peresters in polymerization reactions has been limited to a few which are representative of three classes having present day industrial importance:

1. Single phase (or bulk) polymerizations of unsaturated monomeric compounds reacted alone or in combination to form copolymers.
2. Two-phase (or emulsion) polymerizations of unsaturated monomeric compounds.
3. Polymerization (or curing) of low or contact-pressure modified polyester laminating resins.

Such reactions all involve the opening of a double bond and the linking of the single valence bonds so produced, to form long-chain polymers. These may be of a thermoplastic, thermosetting, or elastomeric nature, depending upon the original monomers reacted and the existence of side chains or "cross-links" in the macromolecular products.

The exact role played by the novel peroxides considered here, in catalyzing such reactions, and what happens to them during and after polymerization, is not definitely known at present. Some work has recently been published[10] on (*Please turn to page 216*)

[9] The method used was developed in this laboratory, using a modified capillary-tube melting point apparatus. The temperature was raised in steps of 1° C. and held for 15 min., fresh samples being used at each temperature. The thermal decomposition temperature was taken as that at which the first visible signs of decomposition were noted.

[10] "Studies in organic peroxides, VIII. *t*-Butyl hydroperoxide and di-*t*-butyl peroxide," by Nicholas A. Milas and Douglas M. Surgenor, J. Am. Chem. Soc. *68*, 205 (1946).

Table V.—Effect of Accelerator 1000 on the Gel Time of Various Polyester Resins in the Presence of Different Peroxides

Resin	*Cure temp.*	*Peroxide*	*Observed gel time*[a]		
			0.1% Acc.	*0.5% Acc.*	*1.0% Acc.*
	° C.		*min.*	*min.*	*min.*
Laminac 4125	50	1-Hydroxycyclohexyl hydroperoxide-1	48	19	15
		di-*t*-Butyl peroxide	10	I	I
		di-*t*-Butyl diperphthalate	40	12	9
		t-Butyl perbenzoate	>60	4	I
		Benzoyl peroxide	33	5	4
Selectron 5003	50	*t*-Butyl hydroperoxide 60 percent	6	4.5	4
		1-Hydroxycyclohexyl hydroperoxide-1	38	16	15
		t-Butyl perbenzoate	4	3.5	3.5
		di-*t*-Butyl diperphthalate	8	7	6
		di-*t*-Butyl peroxide	22	14	12
		Benzoyl peroxide	20	10	9
Vibrin 103	50	1-Hydroxycyclohexyl hydroperoxide-1	25	3	3.5
		di-*t*-Butyl diperphthalate	11	10	6
		t-Butyl hydroperoxide	15	37	17
		di-*t*-Butyl peroxide	32	I	I
		t-Butyl perbenzoate	19	17	15
		Benzoyl peroxide	8	2	1.5
Allymer CR-39	100	*t*-Butyl perbenzoate	95	78	87
		Remainder of this group	...	...	>135

[a] I = practically instantaneous.

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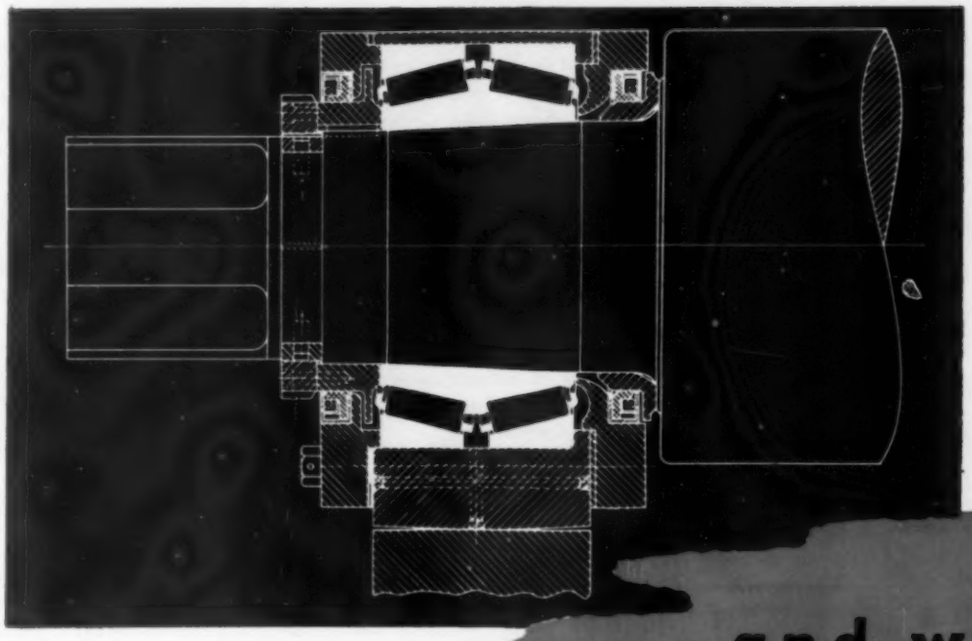

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General

PROBLEMS IN THE UTILIZATION OF WOOD WASTE. R. S. Aries. Mechanical Eng. *69*, 120–2 (Feb. 1947). The utilization of wood waste and the relative importance of wood in our civilization are discussed. Lamination of small pieces to make useful larger pieces is one of the methods suggested for utilizing some wood waste.

USE OF VELON MONOFILAMENTS. G. P. Rowland, Jr. Cotton *110*, No. 10, 184, 186 (1946). The properties of monofilaments made of a vinylidene chloride—vinyl chloride copolymer are described in this article.

SYSTEMATIC SCHEME OF IDENTIFICATION FOR ORGANIC FINISHING AGENTS. J. H. Skinkle Am. Dyestuff Reporter *35*, 449–52 (1946). An analytical scheme is given for identifying the soaps, oils, resins, waxes, and other chemicals used for finishing textile materials. A large variety of plastics and resins are used for this purpose.

Materials

SOME PHYSIOCHEMICAL PROPERTIES OF CARBOXYMETHYL CELLULOSE. E. H. Shaw, Jr., Proc. S. Dakota Acad. Sci. *25*, 57–61 (1945). Physiochemical properties of sodium salt of carboxymethyl cellulose are discussed.

SYNTHESIS OF THE BUTYL ETHERS OF DIVINYLACETYLENE. A. L. Klebanskiĭ, I. M. Dolgopolskii and D. M. Krasinskaya. J. Applied Chem. (U.S.S.R.) *19*, 286–92 (1946); Chem. Abstracts *41*, 685 (Feb. 10, 1947). Methods for synthesizing the butyl ethers of divinylacetylene are described. These are capable of polymerizing to make resins with film-forming properties.

POLYMERIC AMIDES FROM DIAMINES AND DIBASIC ACIDS. D. D. Coffman, G. J. Berchet, W. R. Peterson and E. W. Spanagel. J. Polymer Sci. *2*, 306–13 (June 1947). Methods for the preparation of fiber-forming polymeric amides from polymethylene diamines and polymethylene dicarboxylic acids, and the stabilization of these polymers against viscosity changes are described. The variation in physical properties, particularly melting points, of the polymeric amides with increasing chain length of the components is discussed.

CHEMISTRY AND TECHNOLOGY OF THE ORGANIC ISOCYANATES. S. H. Pinner. Plastics (London) *11*, 206–11, 215, 270–80 (Apr., May 1947). The preparation, properties and reactions of isocyanates, the types of polymers produced and possible applications of the polyurethanes are reviewed. Ninety-two references.

Plasticizers

APPLICATION OF A MECHANISTIC THEORY OF SOLVENT ACTION TO PLASTICIZERS AND PLASTICIZATION. A. K. Doolittle. J. Polymer Sci. *2*, 121–41 (Apr. 1947). The conventional thermodynamic theory of solvent action is briefly reviewed. A mechanistic theory is advanced to supplement the thermodynamic theory. The mechanistic theory views a resin solution as an example of dynamic equilibrium between the tendency of the solvent molecules to solvate the resin and the tendency of the resin macromolecules to unite with each other in three-dimensional aggregation. A plasticizer, being a nonvolatile solvent, remains in the resin film on evaporation of the solvent and thus opposes, to an extent depending on its concentration and solvent strength, the aggregation of the resin macromolecules. Although the permanence of plasticizers in resinous compositions does not correlate well with Doolittle's measure of the relative strengths of the plasticizers, very satisfactory correlation is obtained between the low-temperature behavior of plasticized films and the temperature dependence of the solvent strength of the plasticizers. Data are presented in support of the contention that a necessary condition for good low-temperature performance in plasticized resinous compositions requires that the plasticizer must show a considerable improvement in solvent strength on cooling.

Molding and fabricating

MECHANICAL PRECISION IN MOLDED PLASTICS PARTS. S. K. Moxness. Mechanical Eng. *69*, 479–81 (June 1947). Factors involved in precision molding of parts from phenolic molding compounds are discussed. Conventional tolerances of ±0.003 in. can be cut to ±0.0015 in. provided all the factors are properly controlled. These factors are part design, mold design and construction, uniformity of composition of molding compounds particularly with respect to bulk factor and moisture content, preheating, correct molding cycle, and postconditioning or afterbaking. The density of the molded pieces will be uniform if all factors are controlled. The effects of these various factors are shown in the molding of periscope heads. One such part was 7 in. long with 24 holes and the length was maintained to a tolerance of +0.000 to −0.010 inch.

MOLDING REPLACES FORMING TO PRODUCE PLASTIC CUP. H. C. Haaxma. Materials & Methods *26*, 71–4 (Aug. 1947). Small plastic cups designed to serve as individual ice cube formers were previously formed from ethyl cellulose plastic sheet. The cups are now molded at considerably lower costs. This is caused by higher output, lower scrap loss, lower labor costs, and need for fewer machines.

Applications

EXPERIMENTAL MANUFACTURE OF PAPER FOR WAR MAPS. C. G. Weber and M. B. Shaw. Paper Ind. Paper World *28*, 1137–40 (1946). Map papers with high tear and wet strength, high opacity and good smoothness were obtained by using fiber furnishes of 100 percent strong bleached sulfate pulps with 3 percent melamine-formaldehyde resin for wet strength and 3 percent titanium dioxide for opacity. The steps in the papermaking process and the preparation of the pulp need to be controlled carefully to obtain the maximum fiber strength.

Coatings

POLYMERIZATION OF HEAT-HARDENING SYNTHETIC RESINS BY INFRARED AND ULTRAVIOLET RAYS. G. Nedey. Peintures, pigments, vernis 22, 109–17, 153–60, 181–9, 219–25 (1946); Chem. Abstracts *40*, 7693 (Nov. 20, 1946). Test results with urea-formaldehyde and glyceryl phthalate show that infrared radiation used in curing the resin films acts only as a source of heat whereas ultraviolet radiation acts as a catalyst. Too long exposure to ultraviolet may cause depolymerization. The destructive action is caused by wave lengths less than 0.25μ and the photocatalytic effect by wave lengths between 0.25 and 0.29μ. The infrared and ultraviolet absorption characteristics of many types of resins and plastics, unfilled and pigmented, was investigated and the results reported.

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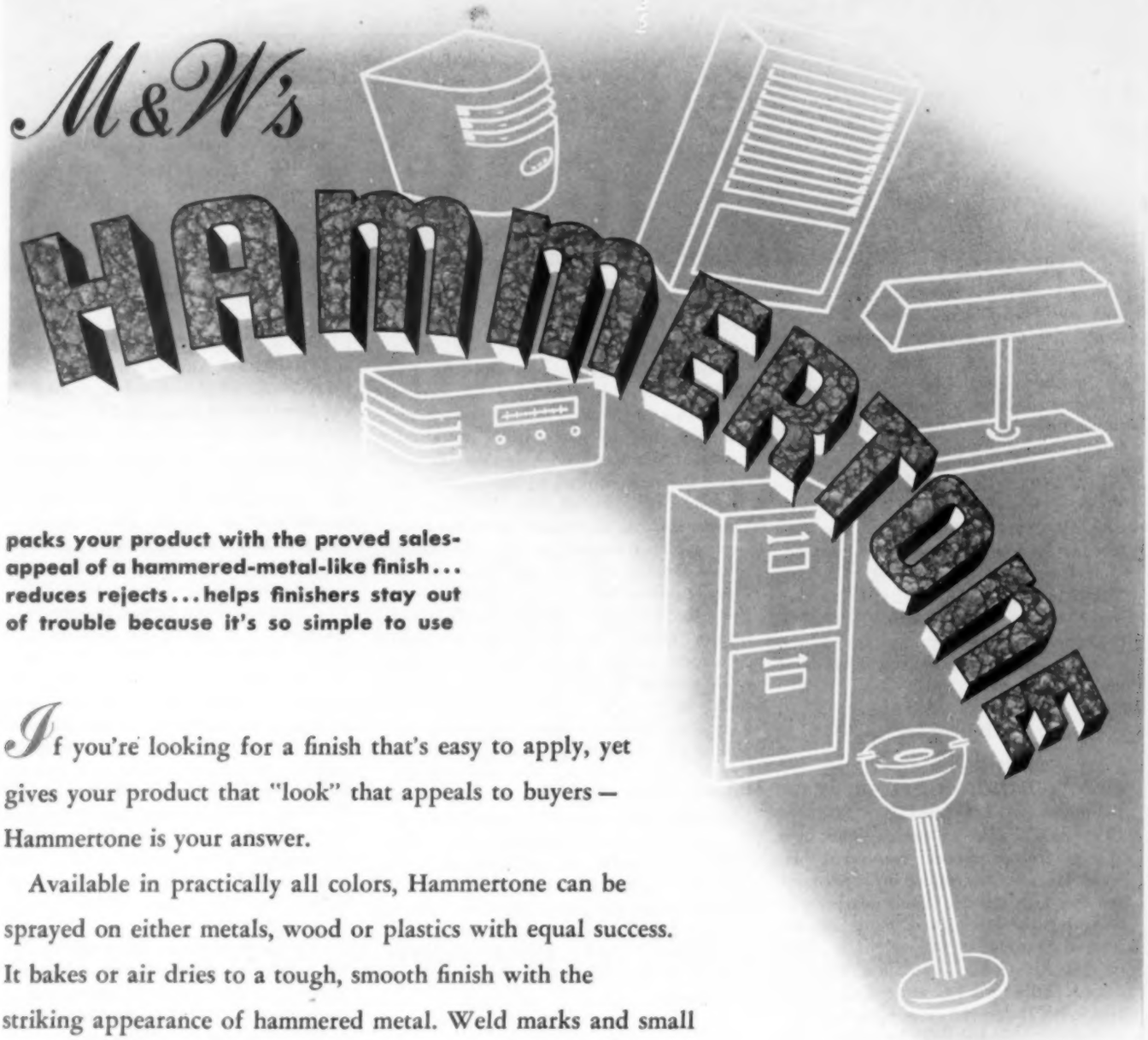

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Abstracts of articles on plastics in the world's scientific and engineering literature relating to properties and testing methods, or indicating significant trends and developments.

Engineering

CLASSIFICATION OF AND TRANSPOSITION NOMOGRAMS FOR ISOTROPIC AND ANISOTROPIC MATERIALS. R. de Fleury. J. soc. ing. automobile *16*, 125–31 (1943); Chem. Abstracts *41*, 543 (Jan. 20, 1947). A universal classification system for constructional materials is proposed. The classification chart is made by plotting the elasticity moduli as abscissas, the elastic elongations as ordinates and the elastic limits as diagonals. The material is then defined as a single point.

PLYWOOD IN BOAT CONSTRUCTIONS. F. W. Hagerty. Mechanical Eng. *69*, 213–17 (Mar. 1947). The factors involved in the design and construction of boats of plywood are discussed. These include distribution of stresses, wood and veneer selection, adhesive requirements, resin-impregnation, joints, molding, assembly, sealers and effect of molds and insects.

Chemistry

MEASUREMENTS OF THE REFRACTIVE INDEX OF FILMS. F. W. Billmeyer, Jr. J. Applied Phys. *18*, 431–4 (May 1947). The refractive index of a film of transparent or translucent material may be determined by immersing the film in a suitable liquid mixture and observing the intensity of light reflected from the surface of the specimen. The composition of the immersion liquid is varied, and a record is made of its refractive index (measured on a refractometer) and of the reflected light intensity. The refractive index of the film is the same as that of the immersion liquid giving the lowest reflected intensity. This has been confirmed by experiments with a glass plate, whose refractive index was known. According to Fresnel's laws of reflection, the experimental data should fit a parabola with its minimum at the refractive index of the film. On fitting the data by the method of least squares, the minimum is obtained with a standard deviation of the order of 0.002 refractive index units. The refractive indices of films of polyethylene, tetrafluoroethylene and hexamethylene sebacamide are reported.

COEFFICIENTS OF THERMAL EXPANSION OF WOOD AND WOOD PRODUCTS. R. C. Weatherwax and A. J. Stamm. Trans. A.S.M.E. *69*, 421–9 (May 1947). The coefficients of linear thermal expansion of resin-bonded birch laminates, both with and without phenolic resin within the cell-wall structure and compressed to various degrees, were determined in the three structural directions. Theoretical equations involving the coefficient of linear thermal expansion values for the wood and for the resin and the values of the modulus of elasticity in compression for the wood and the resin were developed, from which the coefficient of linear thermal expansion values for the laminates may be calculated. Empirical equations for the effect of increased specific gravity due to compression were developed, which, when used in conjunction with the resin-content equations, make it possible to calculate the coefficient of linear thermal expansion values for compressed resin-treated wood. The agreement between the calculated and the observed values was good. Equations were developed for calculating the coefficient of linear thermal expansion values for birch plywood and cross-banded resin-treated birch, either uncompressed or compressed. The agreement between the calculated and the observed values was good in the thickness direction but only qualitative in the sheet direction. This was probably due to shear effects and an edge washboarding effect caused by unbalanced restraint at the ends of the plies. Data were also obtained for the coefficient of linear thermal expansion values of Douglas-fir, Sitka-spruce, and sugar-maple impreg and compreg laminates, parallel-laminated and cross-banded papreg, molded hydrolyzed-wood plastic, and hydrolyzed-wood sheet laminates.

Properties

DIFFUSION OF WATER INTO A POLYMER. J. F. H. Custers. J. Polymer Sci. *2*, 301–5 (June 1947). The diffusion of water into a polymer was investigated by starting from a disk of the material surrounded by water. In this way, actual service conditions are closely approached. Equations are given for this type of diffusion and experiments with a woodflour-filled phenol-formaldehyde material were performed from which values for the permeation constant are derived.

SOME PHYSICAL PROPERTIES OF NYLON. J. B. Speakman and A. K. Saville. J. Textile Inst. *37*, P271–93 (1946). X-rays of oriented and unoriented nylons, water absorption isotherms at 20 and 35° C., swelling on absorption of water and the rigidities at different relative humidities and temperatures were determined in an effort to obtain data which might indicate role of peptide bond in determining elastic properties of protein fibers.

Synthetic rubber

ELECTRICAL CONDUCTIVITY OF GR-S AND NATURAL RUBBER STOCKS LOADED WITH CARBON BLACKS. P. E. Wack, R. L. Anthony and E. Guth. J. Applied Phys. *18*, 457–69 (May 1947). Measurements were made of the direct current conductivity of rubbers loaded with carbon black. Shawinigan and Continental R-40 blacks compounded in natural rubber and GR-S were studied, and the resistivities were determined as functions of time, temperature, concentration and elongation. Resistance decreased with time, at first very rapidly, then more slowly, approaching an equilibrium value. This behavior seems to be independent of the type of black used. Temperature coefficients of resistance at 50° C. were positive for Shawinigan stocks, negative for samples containing R-40 and tended to increase with increasing concentration of black and with increasing extension of the sample. At low concentrations, R-40 gave higher conductance in GR-S than did Shawinigan. At high loadings Shawinigan gave the higher conductance in both GR-S and natural rubber. Resistance increased with elongation for all stocks containing R-40. The Shawinigan GR-S samples showed an inversion; for small elongations the resistance increased on stretching, but for higher extensions the resistance decreased. The results are interpreted on the assumption that the carbon black tends to form chains in the rubber matrix.

LARGE SCALE DISTILLATION OF ISOPRENE. C. F. Fryling. Ind. Eng. Chem. *39*, 882–6 (July 1947). Purification of isoprene on a 1000-gal. scale was conducted by fractional distillation. A product containing more than 99.8 mole percent isoprene was prepared. The progress of the purification was followed by determining the over-all rate of copolymerization of the isoprene with styrene, with a technique which permitted duplication of comonomer conversions to ±0.3 percent. The rate of copolymerization was within 1 percent of that obtained with isoprene prepared through formation of its cyclic sulfone. The isoprene-styrene copolymer, as compared with GR-S, exhibited a tendency to overcure. When vulcanized to an equivalent state of cure, however, it showed improvement in heat-aging and flex-resistance properties.

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U. S. Plastics Patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25 cents each.

PANEL MOLD. C. H. Terry. U. S. 2,421,584, June 3. A sectional mold for casting large size flat panels from plastic materials.

WELDING ELECTRODE. R. H. F. Boot (to Under Water Welders and Repairers Ltd.). U. S. 2,421,594, June 3. An arc-welding electrode consisting of a steel core covered over its working surface with a layer of flux and over the flux a continuous outer skin of tough solid polymer such as vinyl or substituted vinyl polymers.

LINER. R. B. Gray and J. C. De Weese (to Glenn L. Martin Co.). U. S. 2,421,613, June 3. A hydrocarbon fluid container having a flexible lining cell comprising several layers secured together and having an inner lining consisting of a linear condensation polymer preferably of a diprimary diamine and a dibasic carboxylic acid.

COATINGS. P. Holmes (to Metropolitan-Vickers Electrical Co. Ltd.). U. S. 2,421,617, June 3. The method of removing an electrically insulating coating comprising a polyvinyl acetal resin from an electrical conductor, comprising immersing the coated conductor in a bath of molten potassium iodide at a temperature between 700 and 750° C. and for a time sufficient to effect the removal.

ABRASIVE WHEEL. S. S. Kistler (to Norton Co.). U. S. 2,421,623, June 3. An abrasive article comprising abrasive grains bonded as an integral porous body by a vitrified ceramic material and a two-phase filler comprising essentially a saturated aliphatic straight chain polymer containing chlorine.

RUBBERLIKE SUBSTANCES. C. G. La Crosse. U. S. 2,421,627, June 3. A reinforcing compounding material which is solid at room temperature and which comprises a combination of tall oil and a polymerized cut of coal tar type solvent naphtha which contains polymers of styrene, methyl styrene, and coumarone and indene.

INSULATING TAPE. A. A. New, S. G. Foord and D. R. Beckwith (to International Standard Electric Corp.). U. S. 2,421,640, June 3. An insulating tape which is permanently sticky at room temperature comprising a tape body impregnated with alpha methyl styrene.

SILICON POLYMERS. R. O. Sauer (to General Electric Co.). U. S. 2,421,653, June 3. The process comprising effecting reaction at room temperature between a hydrocarbon substituted polysiloxane and a halogenosilane.

VINYL POLYMERS. T. H. Rogers, Jr., and R. D. Vickers (to Wingfoot Corp.). U. S. 2,421,852, June 10. A thermoset polymer is prepared by mixing vinyl chloride, vinylidene chloride, an aliphatic amine and a heat hardenable resin prepared by condensing a phenol with an aldehyde and subjecting the mass to heat until there is obtained a polymeric material of at least 50 percent greater strength than the uncured stock.

COPOLYMER. H. L. Gerhart (to Pittsburgh Plate Glass Co.). U. S. 2,421,876, June 10. A hard resinous copolymer is prepared by heating a mixture of styrene and an ester of tetrahydrophthalic acid and a glycol consisting of 2 to 4 ethylene groups bridged together through oxygen linkages, said heating being conducted at a temperature of 60 to 100° C. in presence of peroxide catalyst.

CELLULOSE ESTERS. J. D. McCaleb and J. J. Reis, Jr. (to Pittsburgh Plate Glass Co.). U. S. 2,421,897, June 10. A process for forming a uniform smooth mixture of cellulose triacetate in a mixture of methyl alcohol and dichloromethane comprising baking the triacetate at 212 to 220° F. for 1 to 2 hr. and immediately uniting with solvent mixture.

MOLD. S. R. Davis (to Maryland Plastics, Inc.). U. S. 2,421,928, June 10. Molded articles are prepared in a sectional mold by molding on the article in the closed mold sections, a part projecting above the surface and not desired on the finished article anchoring said part to one mold section, utilizing said anchored part to retain the article on the section to which it is anchored when the sections are opened, removing the article without removing the anchored part by breaking the article therefrom and removing by tumbling, the projecting roughness.

VINYL POLYMERS. C. A. Sperati (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,421,971, June 10. A hydrolyzed interpolymer of a terminally ethylenically unsaturated mono-olefinic hydrocarbon with vinyl ester of mono-carboxylic acid.

CELLULOSE ETHERS. J. B. Dickey and J. G. McNally (to Eastman Kodak Co.). U. S. 2,422,000, June 10. A method for preparing sulfoalkyl ethers of cellulose, comprising reacting cellulose with ethionic acid, carbyl sulfate or a salt of ethionic acid.

PLASTIC FINISHING. R. H. Hunt, Jr. (to Monsanto Chemical Co.). U. S. 2,422,017, June 10. Surface imperfections on articles of cellulose acetate are permanently removed by softening the surfaces with a solvent mixture of acetone and methyl ethyl ketone and ethyl lactate or dioxane, removing excess solvent, and finishing under heat and pressure.

BATTERY SEPARATOR. E. C. Uhlig (to United States Rubber Co.). U. S. 2,422,148, June 10. An embossed microporous battery separator is produced by forming a microporous sheet of heat-softenable organic plastic material, wetting said sheet with a liquid non-solvent which boils slightly above the embossing temperature, subjecting the sheet to hot embossing pressure, cooling with air while under pressure and removing pressure.

VARNISH. L. Auer (to Ridbo Laboratories, Inc.). U. S. 2,422,175, June 17. A varnish prepared by cooking above 240° C. a varnish base mixture of a varnish resin and a varnish oil such as chinawood, oiticica, dehydrated castor oil, or an ester of a long chain unsaturated fatty acid and an alcohol having at least 4 hydroxyl groups together with a mixture of rosin and rosin hydrocarbons.

FUEL CONTAINER. H. S. Holt (to E. I. du Pont de Nemours & Co., Inc). U. S. 2,422,239, June 17. A self-sealing container comprising a plurality of adherent laminae, said laminae comprising an inner layer of high molecular weight rubbery polyesteramide, a layer of vulcanized rubber capable of swelling under the action of hydrocarbon solvent and a layer of plasticized neoprene positioned between the first two layers and adapted to close perforations formed through the structure, said polyester-amide being the high molecular weight, tough, rubberlike reaction product of a hexamethylene diisocyanate with the lower molecular weight polyesteramide comprising reaction product of adipic acid, ethylene glycol, hexamethylene diammonium adipate.

REFLECTING FILM. M. H. Phillipi (to Minn. Mining & Mfg. Co.). U. S. 2,422,256, June 17. In combination with a base having a reflective surface, an overlying preformed flexible transparent optical sheet having a number of small

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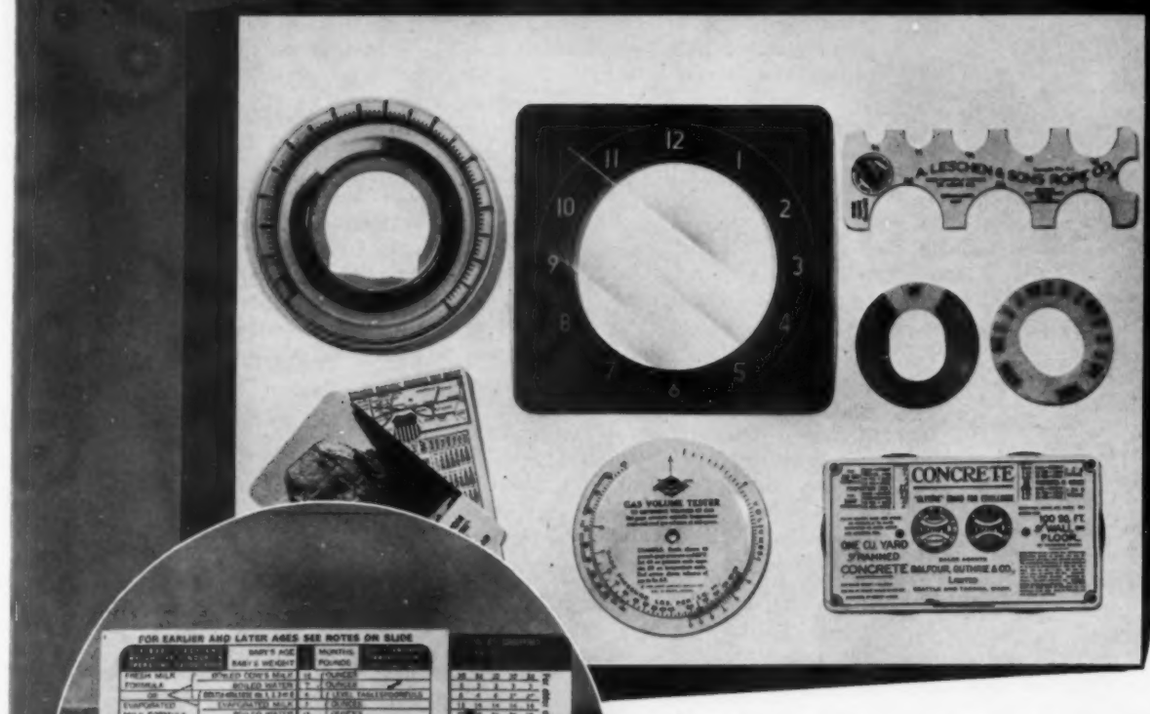

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contiguous glass beads partially embedded in a transparent bonding medium.

DRYING-OIL COMPOSITION. B. C. Pratt (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,422,259, June 17. A process comprising heating at 275 to 280° C. a mixture of alkali-refined linseed oil and low-viscosity, low-hydroxy polyvinyl butyral until a compatible, homogeneous mixture results.

MODIFIED POLYESTERAMIDES. G. T. Vaala and C. E. Frank (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,422,271, June 17. Tough, durable, high molecular weight polymers are prepared by incorporating a catalyst and the resinous condensate of urea-formaldehyde and a monohydric alcohol with the thermoplastic, organic-solvent soluble, rubbery and millable reaction product of a linear polycarboxylic ester carbon amide containing ester and amide groups interlinearly in the polymer chain and a cyanate substance, and heating composition obtained until resulting product is essentially non-thermoplastic and insoluble.

INSULATION. R. T. Adams (to Western Electric Co., Inc.). U. S. 2,422,281, June 17. An apparatus for covering conductors which consists of a horizontal block having a vertically disposed die opening formed in the central portion thereof, said die opening having a bell-shaped upper portion, means for liquefying a thermoplastic material positioned on the top of the block and means for passing conductor through opening.

RESINS. E. A. Lasher (to California Flaxseed Products Co.). U. S. 2,422,356, June 17. A resin comprising an interesterification product of an acid ester of an hydroxylated fatty glyceride oil with citric or malic acid or a mixture of citric and lactic acids and a diethylene glycol ester of phthalic or adipic acid.

POLYMERS. M. M. Brubaker, J. R. Roland and M. D. Peterson (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,422,392, June 17. In a process for producing ethyl-vinyl chloride polymers, the step comprising carrying on the polymerization at a temperature between 30 and 300° C. under 5 to 3000 atmospheres pressure in the presence of an organic peroxide catalyst, 0.1 to 50 parts of water, a buffer capable of maintaining the pH between 7 to 11, and a reducing salt such as a sulfite, bisulfite, hydrosulfite or formaldehyde sulfoxylates.

PAPER TREATMENT. H. M. Kvalnes (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,422,423, June 17. The dimensional stability of cardboard paper products is improved by dipping into a solution of water and methylol ureas having a formaldehyde-urea ratio between 1.3 and 1.6 at a pH between 7.0 to 9.0, withdrawing the cardboard, drying, and heating between 280 to 320° F. under a pressure of 200 to 1000 p.s.i.

VINYL-RUBBER COMPOUNDS. R. A. Jacobson (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,422,550, June 17. Natural rubber is copolymerized with a polymerizable monoethylenically unsaturated compound by reacting at temperatures between 0 and 100° C. an aqueous emulsion of a natural rubber and said monomer admixed with a polymerizable, monoethylenically unsaturated compound containing a terminal methylene group attached by a double bond to a carbon atom which in turn is attached to a negative group such as aryl, halogen, acyloxy, carboalkoxy, acyl, or cyano group, said medium having also dissolved therein a perdisulfuric acid and a dispersing agent comprising a metal salt of an organic sulfonic acid.

TEXTILE TREATMENT. L. Lilienfeld (to Lilienfeld Patents, Inc.). U. S. 2,422,572-3, June 17. A process for finishing textiles, comprising applying thereto a dispersion in aqueous alkaline solution of a degraded cellulose derivative which is at least partially soluble in alkali, but insoluble in water and in aqueous alcohol, coagulating same on the textile in the form of particles, said derivative comprising a cellulose ether, ester, ether-ester, thiourethane or xanthate ether.

CONDENSATE. C. A. Thomas (to Monsanto Chemical Co.). U. S. 2,422,637, June 17. Resinous condensate formed by heating phenol with styrene oxide.

EMULSIONS. W. Starck and H. Freudenberger (to Attorney General). U. S. 2,422,646, June 17. The process comprising polymerizing an emulsion of a mixture of vinyl acetate and vinyl butoxyacetate in an aqueous solution of polyvinyl alcohol, containing hydrogen peroxide as catalyst.

CEMENT SURFACE COVERING. R. H. Fredrickson and H. N. Stephens (to Minn. Mining and Mfg. Co). U. S. 2,422,665, June 24. A cement floor, wall or the like comprised of a continuous base surface and a magnesium oxychloride cementitious wearing surface adhesively secured to the base by means of an elastomer comprising an interpolymer of methyl acrylate and ethyl acrylate.

POLYCARBONAMIDES. C. S. Fuller (to Bell Telephone Laboratories, Inc.). U. S. 2,422,666, June 24. A tough elastic rubbery infusible synthetic linear polycarbonamide containing a finely dispersed chromic salt which is the product of the process comprising contacting an amorphous, fusible, water-insoluble, synthetic, linear polycarbonamide, the molecules of which consist of bivalent hydrocarbon radicals joined by carbonamide linkages, with a finely dispersed chromic salt as the sole ingredient capable of rendering said polyamide infusible, said chromic salt readily forming an amine stable at ordinary temperatures.

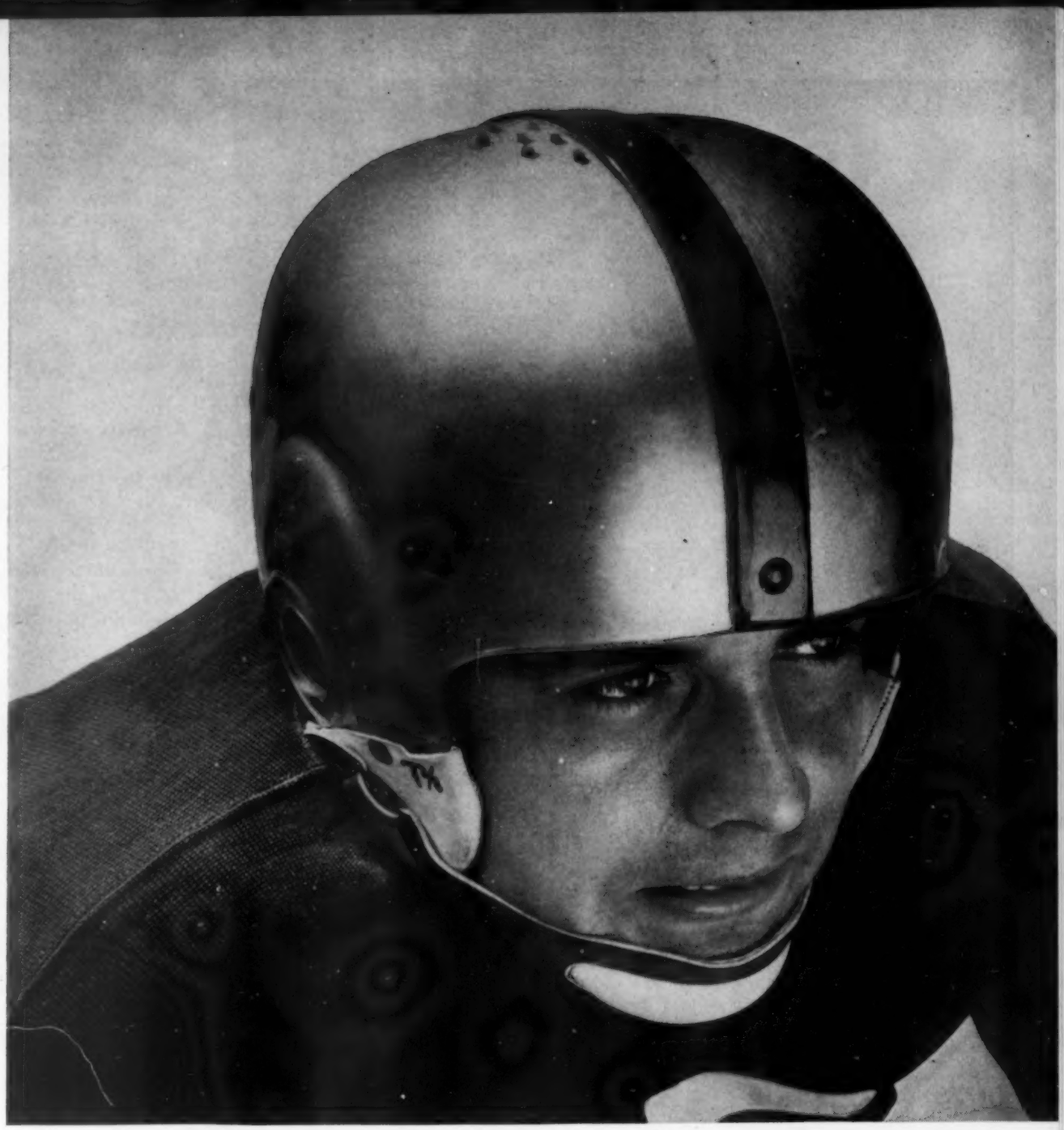
SEAM-FORMING APPARATUS. H. H. Haman and J. A. Ritzler (to Warren Featherbone Co.). U. S. 2,422,676, June 24. An apparatus for forming a waterproof seam for interconnecting two fabrics coated with polyvinyl resinous material, whereby a fabric tape coated with polyvinyl resinous material overlies the stitched seam with the coating of the tape contacting said seam, and means for supplying heat, pressure to cause resinous material to penetrate holes caused by stitching.

FLAMEPROOFED FILM. W. A. Hoffman (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,422,730, June 24. The process comprising impregnating regenerated cellulose film with an aqueous bath containing a salt of sulfamic acid, an aliphatic polyhydric alcohol softener and formaldehyde-yielding material and drying the film, whereby a transparent, flameproof, durable film is formed.

CELLULOSE ETHER CANTEEN. J. Pritchard and D. Flitter (to Celanese Corp.). U. S. 2,422,747, June 24. A high impact strength plastic material suitable for use as water containers of improved resistance to shock, heat and cold, consisting of ethyl cellulose, refined mineral oil and butyl stearate.

POLYVINYL ACETAL RESINS. G. S. Stamatoff (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,422,754, June 24. Polyvinyl acetal resins are prepared by adding polyvinyl alcohol in a water solution at a temperature of 25 to 90° C. gradually, with agitation, to an aldehyde such as benzaldehyde or a saturated aliphatic aldehyde in the presence of an acid catalyst; the agitation being such as to cause precipitation of the resin as formed in finely divided state, and thereafter maintaining the reaction mixture under agitation at 40 to 90° C. until the reaction has proceeded to the desired end point.

CHLORINATED POLYTHENES. J. R. Myles and P. J. Garner (to Imperial Chemical Industries Ltd.). U. S. 2,422,919, June 24. A process for the manufacture of chloropolythene comprising dissolving polythene in boiling carbon tetrachloride, cooling with rapid stirring to a temperature of about 25° C., displacing the air in the mixture with an inert gas during the boiling and cooling to produce a suspension of polythene, replacing the inert gas by chlorine containing 0.1 percent oxygen, illuminating the mixture with artificial illumination rich in green and yellow light of 4785 Å and below, but not rich in ultraviolet radiation, removing at least part of the reaction heat, continuing introduction of chlorine until a chloroprene of about 50 percent of chlorine is obtained, then separating chloropolythene from reaction mixture.



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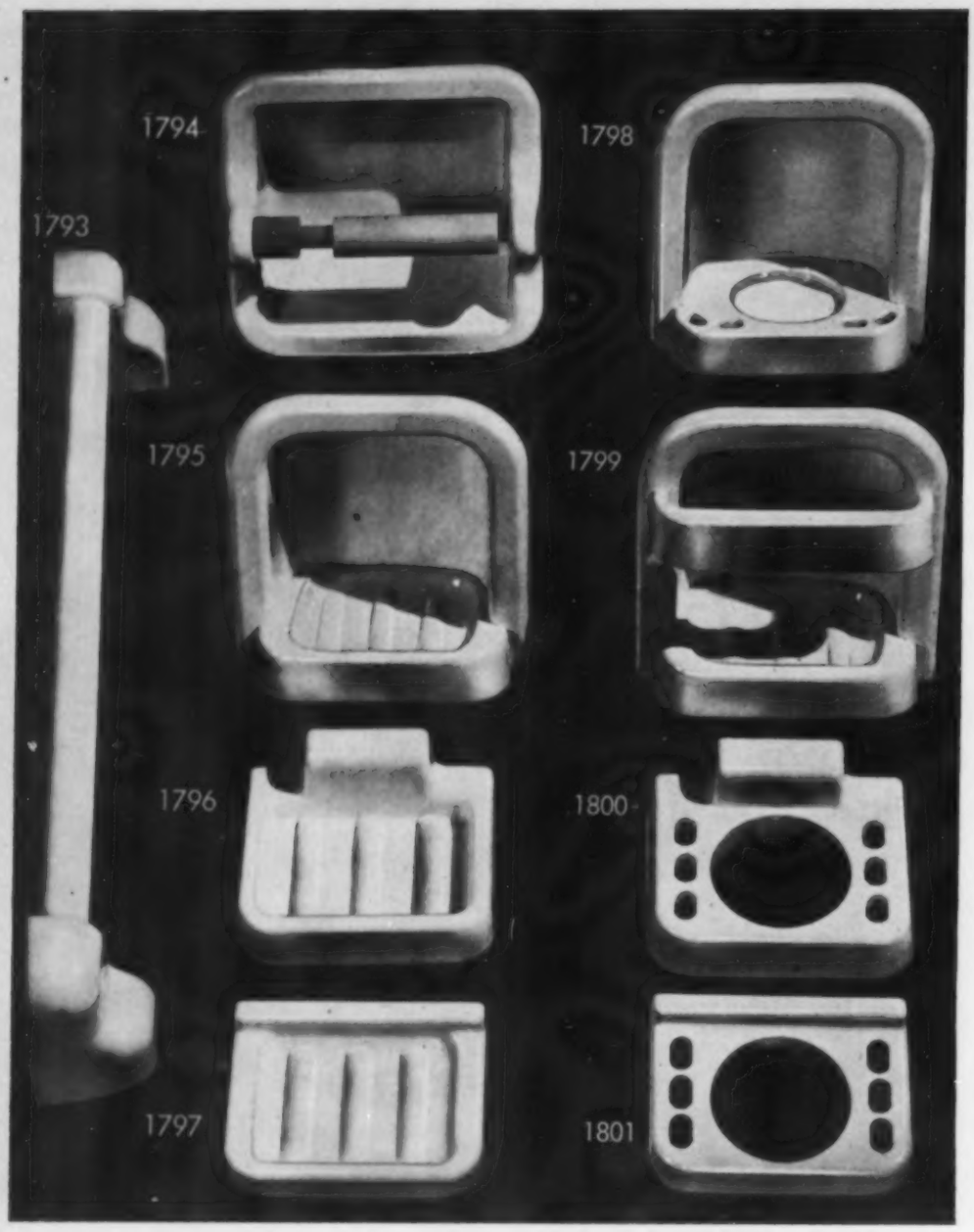

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1794. Recessed paper holder.

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1796. Soap dish.

1797. Soap dish.

1798. Recessed toothbrush and tumbler holder which is removable from the slot.

1799. Recessed soap dish removable from slot with grab bar.

1800. Toothbrush and tumbler holder.

1801. Toothbrush and tumbler holder of slightly different design.

* Reg. U. S. Patent Office.

R. R. Car Builders

"Flag" AMERICAN PHILLIPS Screws

for "Express Train" Assembly Speeds that Cut Costs for Streamlined Looks that Sell* Customers

"HIGHBALL" PRODUCTION — "Highball's" the railroad term for *get moving*—and that's just what you do when fumble-proof, power-driven American Phillips Screws take over! Whether you make streamliners, appliances, radios or what not, American Phillips Screws can't slip off "the track" to harm work or worker—and there isn't a burred screw head in a carload. This *automatic,* speedy driving of engineered screws *ups* production schedules while gaining time-savings as high as 50%!

"HIGHBALL" PROMOTION — Smart, sleek, streamlined American Phillips Screws tell a quality story FAST—are a modern complement to high-style products. They can't snag hose or clothes. And more and more buyers spot them as a tip-off to solid construction and longer service. Whether you sell industry or the consumer, get the facts on the DOUBLE advantages (in production and promotion) provided by American Phillips Screws.

*The railroads *and* the public.

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Wing, cap, and hexagonal nuts seen above make use of nylon bonded within the metal for self-locking features

Nylon locks nuts

ABILITY TO withstand moisture, varying degrees of temperature, gasoline and oil, fungus, age and wear, and a high degree of resiliency are among the advantages which have led to the use of nylon in self-locking nuts. The nylon, secured within the metal nut, grips the threads of the inserted bolt so tightly that it cannot loosen.

Two companies are now making use of nylon in their nuts. The Nylok Corp., 475 Fifth Ave., New York City, is putting out a nut (right, above) designed primarily for aircraft and electrical uses, and manufactured in sizes from #4 to 10. This nut utilizes, as its locking medium, a hexagonal insert of FM-1 nylon. This nylon is molded under heat and pressure to fit the nut, and is then set into the nut by machine and staked.

New ESNA nylon cap, wing, and hexagonal nuts, produced by Elastic Stop Nut Corp., Union, N. J., have nylon locking collars clinched into the nut. In cap nuts, the collar and cap are molded in one piece.

Cap nuts have long been used to cover bolt ends for safety purposes or for appearance. With the introduction of nylon, they can now be used to seal bolt threads against the internal leakage or the external penetration of moisture, and a number of common solvents. A new range of applications—use on equipment containing liquids or gases under pressure or vacuum—has been opened up, for nuts up to $\frac{1}{2}$ in. can withstand pressures in either direction as high as 1000 p.s.i.

These cap nuts are recommended for use where entire sub-assemblies or finished mechanisms must be plated or anodized as units, and immersion time is governed by the plating cycle. They are reported as satisfactory for service where sustained operating temperature does not exceed 250° F. in dry atmospheres. Where fastenings are immersed, operating temperatures as high as 300° F. may be maintained.

Plumbing fixtures

Washing machine agitators

Automobile instrument panels

IF IT'S A BIG PLASTIC PART... GENERAL AMERICAN CAN BUILD IT BETTER!

Refrigerator door trim

YOUR PRODUCT ?

An impressive battery of the world's largest injection molding presses

General American has the engineering skill, the creative imagination, and the equipment to manufacture large and complex plastic parts.

Waiting to serve you at General American are batteries of large-volume injection molding presses, including the 32-oz. type, and compression presses ranging up to 500-ton, 1000-ton and 2000-ton capacities. That means *volume*—a smooth flow of plastic parts to your production lines.

Submit your plastics problems to us for design, engineering and prompt quotations.

PLASTICS DIVISION
GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street • Chicago 90, Illinois

*Reg. U. S. Pat. Off.

Illustration shows difference between flammable and non-flammable plastics. When each is lighted with a match, the flammable variety (top) continues to burn like a match stick; the non-flammable type (Vibrin 140) stops burning as soon as the match flame is removed.

Vibrin 140—one of a family of liquid thermo-setting resins—has the additional feature of being fire-retardant.

Used as a laminating or impregnating resin with glass cloth and matting; or with fabric or paper which has been fire-proofed—a product results which will not support combustion. Used by itself or with mineral fillers, the cured resin is also self-extinguishing.

This Vibrin is specially recommended for the production of decorative panels, screens, wall boards or other structural members where the self-extinguishing characteristics of the resin are an added desirable feature. On airplanes, trains, automobiles, boats—in hospitals, theaters, homes, and public buildings!

Vibrin 140 is a clear, transparent liquid which may be pigmented to any color or dyed to any desired shade. It has low moisture absorption; it cures fast, and it works in all conventional laminating processes.

Other types of Vibrin resins now available. Shipments in 50 gallon drums and 5 gallon containers from Naugatuck, Conn., or Los Angeles, Calif. Technical booklets on these resins and on application practices. Write

NAUGATUCK CHEMICAL

Division of United States Rubber Company

NAUGATUCK, CONNECTICUT

Merchandise is used as a package in selling bowl covers. Largest bowl cover slips over the display disk while the other covers are fitted beneath the instruction sheet

Two selling ideas

REFRIGERATOR bowl covers are dressing up in "new silhouettes." In place of the flat envelopes which have been the standard package, plastic bowl covers are appearing in bright, original packages which stimulate sales.

Most unusual is a package of seven "Plasticoid" Vinylite plastic covers made by Clarvan Corp., Milwaukee, Wis. The largest cover also serves as the outer covering of the package. A paperboard disk gives rigidity to the sandwich-like package which includes: the six remaining bowl covers, a full-color illustration of possible uses of the product, and a printed paper disk listing the contents and selling points. The seventh bowl cover, which holds the package together, offers the prospective buyer an example of the texture and quality of the contents. The vinyl covers have been found to be airproof, dustproof, and waterproof.

Buyers can also see and feel the Gold Stripe plastic bags in a second new package. Poly-Tex, Inc., Elgin, Ill., fabricates the bags from Polythene. A simple cutout in the box top serves as a window to show the customer what she is getting and to induce her to get it.

Part of polyethylene bag shows through package window

The five-story coating resin unit is at left. At far right is steam plant, pilot plant, and laboratories

New coating

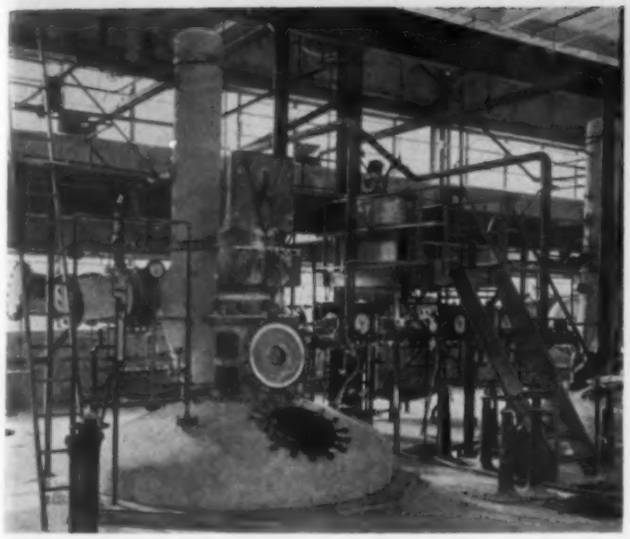
PRELIMINARY operation of the new coating resin plant of the Plaskon Div. of Libbey-Owens-Ford Glass Co., a unit in the $9,000,000 chemical factory layout at Glendale Ave. and Toledo Terminal railroad, Toledo, Ohio, is now under way with full-scale production scheduled before the end of the year.

William W. Knight, Jr., general manager of Plaskon, disclosed the limited initial production at the plant coincident with announcement that Plaskon had entered the coating resin field under its own name by absorbing the former Paramet Corp., which Libbey-Owens-Ford acquired in 1943. Thus Plaskon is making available comprehensive research and development facilities for the improvement of the resins formerly produced by Paramet and for the continuing development of new coating resins.

Manufacturing operations are conducted in the five-story section of the plant, permitting gravity flow of resin from the charging deck on the top floor to the filling equipment on the lower floors. All raw material handling equipment is of the scale type to assure accurate charging of the huge processing kettles, and is designed to streamline production. Raw material testing and production control laboratories operate on a 24-hr. schedule. Handling of containers by conveyor is controlled by photoelectric cells.

Mr. Knight said the new plant will manufacture a variety of resins, including urea formaldehyde, phenol formaldehyde, maleates, estergums, as well as specialty resins.

"Natural resins have been used in the making of paints, varnishes, and other types of protective finishes, for hundreds of years," he explained. "It is only in re-



One of a battery of 30,000-lb. resin kettles to be used in the new coating resin plant is pictured here

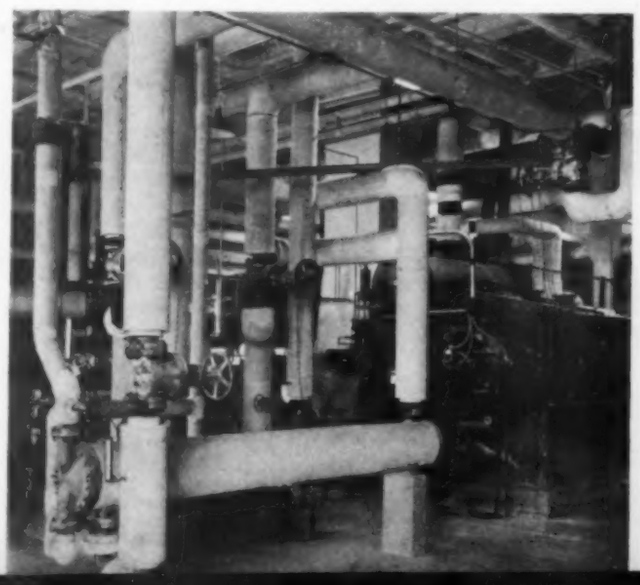
resin plant

cent years that synthetic resins have given the paint industry improved resins and in great diversity to meet specific requirements. Today the resins are virtually tailor-made to fit the job the paint product is to do."

B. W. Slater, manager of operations of the Plaskon Div., and C. Homer Flynn, sales manager for coating resins, are executives who came into the organization from the Paramet subsidiary.

Dr. A. M. Howald, technical director of Plaskon Div. will be in charge of research and development. Other experienced personnel will include Dr. J. A. Murray, in charge of technical service, K. D. Meiser, general production manager, and O. P. Clipper, production manager of coating resins.

Resin kettles are heated by the Dowtherm system for accurate control. Part of this system is seen below



1—This phenolic index provides room for 100 loose memo sheets in addition to 4 by 5 in. index cards

Fingertip indexes

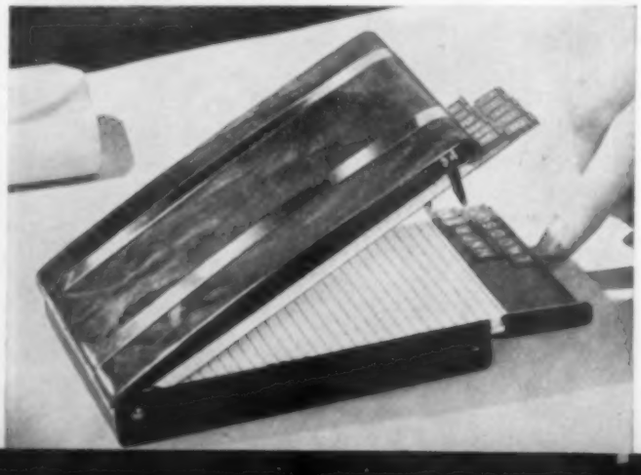
PHONE NUMBERS, addresses and other lists are right at your fingertips with these two new indexes, the Autopoint and the Pressalist. Plastics were selected for the housings of both because of their high gloss, their ability to be molded into an attractive design, and good wearing qualities.

The base and cover of the Autopoint (Fig. 1) are compression molded of black or walnut Bakelite by the Autopoint Co., 1801 Foster Ave., Chicago 40, Ill. This company also injection molds the 13 ivory colored selector keys of Tenite II.

The case of the Pressalist (Fig. 2) is injection molded of marbleized Lumarith by Sterling Plastics Co., Union, N. J., for the Bates Mfg. Co. It is banded with chrome. Loose-leaf pages can be removed so that telephone numbers, etc., can be typed on them.

2—Cellulose acetate is used for the housing of this index. Unit can be quickly opened to desired letter

PHOTO, COURTESY CELANESE CORP. OF AMERICA



CARTER *Pinch Hits* IN PLASTIC BALLOON CRAZE

With the plastic bubble craze sweeping the country by storm, manufacturers have been hard put to find sources of supply for the small tubes required for the bubble making sets.

To 16 such manufacturers the Carter organization came to the rescue and was able on short order to supply the tubes in the large quantities necessary.

This is simply another instance where the ample Carter facilities for quick service have proved equal to unusual demands. Carter is completely equipped to furnish tubing of practically any size and kind to order. Outside diameters 3/32" to 16". Wall thicknesses from .0015" to .250".

When you have an extrusion problem *it's smarter to look to Carter.*

CARTER
PRODUCTS CORPORATION

Manufacturers of Extruded Plastics

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IN INJECTION

MOLDING WITH

AMPACET

POLYSTYRENE AND

CELLULOSE ACETATE MOLDING POWDERS

Formulated to meet the versatile requirements of injection molders, Ampacet has been used successfully for years in the production of innumerable items for home, personal and industrial use. Now available in a great variety of colors and any flow, its possibilities in the manufacture of new products has been vastly expanded. Consider Ampacet for your next runs.

American Molding Powder and Chemical Corp.

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PHONE: ULSTER 5-3887 • CABLE: CHEMPROD BROOKLYN

Powder dispensed from squeezable bottle

THINGS new and novel are the keynote to packaging in the cosmetic industry. And when a material can impart functional advantages as well, it is a natural for use in this field. Flexible polyethylene bottles are among the latest such innovations to hit the market.

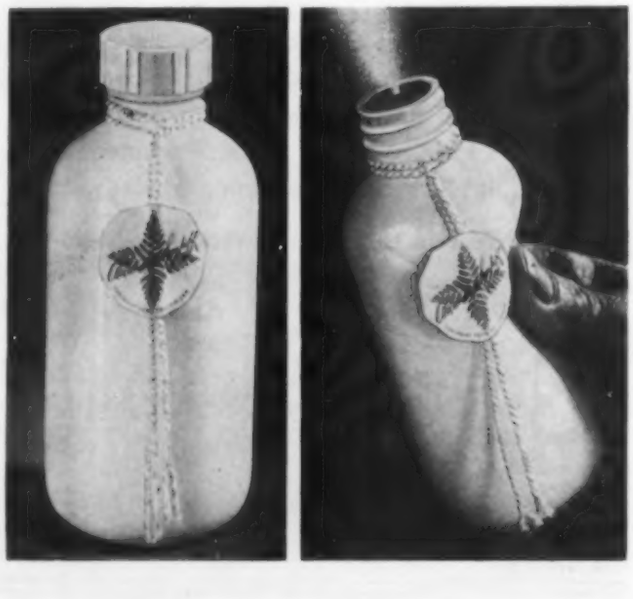
These bottles are squeezable, permitting powder or liquid to be ejected merely by pressing the container. They are attractive, pleasant to the touch, and eliminate the annoyance of numerous and vigorous shakes to get the powder or liquid to come out. In addition, they are light in weight and can be dropped without danger of breaking.

One of the first to use the polyethylene bottle is Alexandra de Markoff of New York City, which has introduced it as a powder container in its Fragrant Fern line of bath preparations.

7 oz. bottle blow molded

Dubbed "talcumizer" and promoted as "the talc of the town," the 7-oz. bottle of frosty white polyethylene is blow molded by the Plax Corp., Hartford, Conn. This company spent several months in perfecting the technical details of the bottle. A cork stopper with a $^1/_{16}$-in. diameter hole in its center is cemented in the neck of the bottle. This size opening was found to permit the proper amount of powder to be ejected per squeeze. White urea was selected for the threaded closure. Directions on how to use the container are given on a die-cut label affixed to the bottom.

When standing, polyethylene bottle looks like any other bottle, but when squeezed, powder is ejected



for the beating an iron cord bushing gets...

Perbunan can "take it"!

PERBUNAN
REG. U.S. PAT. OFF.

THE RUBBER THAT RESISTS OIL, COLD, HEAT AND TIME

Enjay Company, Inc., 15 West 51st Street, New York 19, N. Y.; First Central Tower, 106 South Main Street, Akron 8, Ohio; 221 North LaSalle St., Chicago 1, Illinois; 378 Stuart Street, Boston 17, Massachusetts. West Coast Representatives: H. M. Royal Inc., 4814 Loma Vista Avenue, Los Angeles 11, California. Warehouse stocks in Elizabeth, New Jersey; Los Angeles, California; Chicago, Illinois; Akron, Ohio; and Baton Rouge, Louisiana.

The spot the cord enters the electric iron is where a rubber bushing takes a beating! It must withstand intense heat . . . constant flexing . . . moisture from steam irons . . . and rough-pull usage.

In introducing its post-war steam iron the SILEX COMPANY wanted an *improved* bushing to meet these requirements. Their engineers worked with the research development men of the ACUSHNET PROCESS COMPANY and, after careful testing, *a Perbunan cord bushing* was selected.

HERE'S WHY: Perbunan nitrile rubber *more than meets* the rigid tests of the Underwriters' Laboratories . . . and provides exceptional resistance to deterioration from heat, moisture, aging, flexing and rough handling.

Perbunan also has a new color stabilizer that keeps even the most delicate shades constant . . . with no discoloration of the fluids or materials it contacts.

Whatever rubber problem you may have, our experts will gladly help you solve it. Please write to our office nearest you.

PHOTO, COURTESY MAICO CO.

1—Vinyl tubing connects acrylic earpiece with urea-encased receiver hidden by hair or collar

Hearing aid ear pieces

FIVE million Americans are hard of hearing, but only about half a million of them wear hearing aids. To combat buyer resistance to the conspicuous "button in the ear," two manufacturers have turned to acrylic.

Flesh-color tinted Lucite is used by the Maico Co., Inc., 2632 Nicollet Ave., Minneapolis, Minn., to mold its Secreteer (Fig. 1) to fit individual customer's ear.

The Sonotone Corp., Elmsford, N. Y., provides for a custom-made translucent acrylic ear tip in its new Model 900 (Fig. 2). The all-in-one receiver has a case of rhodium and Melmac, and a battery compartment of Tenite II. Melamine was chosen for its resistance to scratching and corrosion.

2—Ear tip is molded from casting of user's ear

PHOTO, COURTESY SONOTONE CORP.

New surface treatment

for polystyrene

Treated articles have greater resistance to scratching and solvents, will attract less dust, and have better light transmission, according to manufacturer's tests

POLYSTYRENE can be given the surface characteristics of more expensive plastics with a new solution manufactured by the Bee Chemical Co., 63 East Lake St., Chicago 1, Ill. The company claims that treatment with the solution, called Logoquant, gives polystyrene: 18 percent greater scratch resistance; 14 percent greater transmission of incident light; a reversed electrostatic charge, thus reducing the tendency to attract dust particles; increased resistance to toluene, gasoline, and other solvents.

It is stated that the new treatment makes possible the use of polystyrene, costing about 28 cents per lb., in applications previously requiring the use of other plastic materials costing 65 to 80 cents per pound. This is equivalent to a saving of 35 to 52 cents per sq. ft. of treated surface when the plastic panel is $^1/_4$ in. thick. Savings on heavier articles would be higher.

The manufacturer estimates that 1 sq. ft. of Logoquant-treated polystyrene $^1/_4$ in. thick costs between 40.39 and 41.64 cents. This breaks down to 38.64 cents for the untreated material, 1.25 to 2.50 cents for the solution, and 0.50 cent for cost of application.

Application procedure

The Logoquant solution is a transparent liquid of sprayable viscosity. The normal solution contains 10 percent solids, but this proportion can be varied. Specific gravity is 0.90 to 0.94 at 70° F. Flash point is 120° F. by the open cup method.

The process of application takes only 20 min. and requires neither special equipment nor high-temperature curing. The solution can be sprayed on, or articles can be dipped. When dipping is used, an instant dip is sufficient and long exposure is not recommended.

After spraying or dipping, articles may be dried for 20 min. with good ventilation under infrared lamps. The lamps are placed so that air temperature is approxi-

mately 95 to 105° F., and surface temperature of the polystyrene is about 125 to 135° F.

Optimum drying temperatures vary somewhat, depending upon the form of the articles as well as other factors. Reasonable temperature variations are permissible and drying in an oven with convection circulation at 130 to 140° F. has been used successfully.

If relative humidity is less than 60 percent, forced drying can be dispensed with and articles can be air-dried at room temperature. If this method is used, drying time must be increased to 30 minutes. Air drying at humidities higher than 60 percent has been found to result in surface clouding.

Effect of treatment

The success of the treatment depends on actual fusion between the polystyrene and the Logoquant solution. It is not a mere surface coating and, according to the company, the treated surface cannot be peeled off or removed. The treated polystyrene is visually indistinguishable from the untreated plastic.

According to the company's tests, the treated surface is non-toxic and can be used in direct contact with food materials. The treated article has a mar resistance 18 percent higher than untreated polystyrene, 8 percent higher than good spar varnish, and only 7 percent lower than that of transparent plastics which cost three times as much as polystyrene.

The research which led to the development of the Logoquant treatment was initiated by the Nash-Kelvinator Corp. A study had shown that polystyrene plastics were excellently adapted for many automotive applications because of their light weight and low cost. But certain properties (see Table I) prevented its use: it scratched easily and, once scratched, could

Table I.—Improvement in Surface Properties of Molded Polystyrene by Treatment with Logoquant Solution

	Untreated polystyrene	*Treated polystyrene*
Mar resistance (A.S.T.M. method D 673-44—effect on surface transparency of #80 Carborundum grit falling from 25 in.)	82%	100%
Re-polishability (recovery of surface transparency from above test on polishing with cotton cloth)	Marred spot removed with difficulty	Marred spot readily repolished
Light transmission (% of incident light transmitted)	73%	85%
Electrostatic charge	Positively charged (strongly attracts dust)	Negatively charged (repels most dust particles)
Resistance to solvents:		
Toluene	Attacked	Resists
Carbon tetrachloride	Attacked	Resists
Gasoline	Attacked	Resists
Mineral oil	Attacked	Resists

not easily be repolished; cleaning fluids, gasoline, and oil attacked it; and it had such a strong electrostatic attraction for dust that particles wiped from it would fly from the dusting rag back to the polystyrene.

After years of unsatisfactory experiments, Nash-Kelvinator employed the Bjorksten Research Laboratories, 185 N. Wabash Ave., Chicago 1, Ill., to work out a practical solution to the problem. Dr. Johan Bjorksten and his associates succeeded in developing Logoquant and assigned the patents to Nash-Kelvinator. The Bee Chemical Co. was then licensed by Nash-Kelvinator to manufacture the materials for sale to manufacturers and users of polystyrene.

Sorry!

In the article, "Styling a prerequisite to selling," by J. G. Balmer, Jr., appearing in the September issue of MODERN PLASTICS, credit for the molding of the Jaeger Watch Co. clock was incorrect. The molds for this clock were designed and constructed by F & F Mold and Die Works, 103 Sachs St., Dayton 3, Ohio. The domes, mounting plates and lock screws were molded by F & F. Sheller Mfg. Co. molded the base under the supervision of F & F as a sub-contractor.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946, of MODERN PLASTICS, published monthly at Easton Pennsylvania, for November 1, 1947.

State of New York } ss.
County of Kings }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Charles A. Breskin, who, having been duly sworn according to law, deposes and says that he is the Publisher of the MODERN PLASTICS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, Chas. A. Breskin, 122 E. 42nd St., New York City.
Editor, Chas. A. Breskin, 122 E. 42nd St., New York City.
Managing editor, A. Paul Peck, 122 E. 42nd St., New York City.
General manager, A. S. Cole, 122 E. 42nd St., New York City.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Modern Plastics, Inc., 122 E. 42nd St., New York City.
Chas. A. Breskin, 122 E. 42nd St., New York City.
Mrs. C. A. Breskin, 55 Park Road, Scarsdale, N. Y.
Linda S. Breskin, 55 Park Road, Scarsdale, N. Y.
Theodore B. Breskin, 55 Park Road, Scarsdale, N. Y.
Mrs. Helen K. Cole, 55 Elizabeth Rd., New Rochelle, N. Y.
S. Moisseiff, 55 Liberty St., New York City.
E. S. Gregg, 111—8th Ave., New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are:

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

CHARLES A. BRESKIN, Publisher

Sworn to and subscribed before me this 26th day of September, 1947.
[seal] HERMAN. L. ISLER

Notary Public, Kings County
Kings County Clerk's No. 14, Register's No. 24-1-8
New York County Clerk's No. 36, Register's No. 26-1-8
(My commission expires March 30, 1948.)

Phenolic grilles

IN ITS latest model room air-conditioning machine, C. C. Cawthorne & Co., Inc., Box 497, Elizabeth, N. J., uses phenolic intake and exhaust grilles. The plastic grilles give the machine a neat appearance and are easier to clean than metal. The company name, molded into end grille, serves as non-removable label.

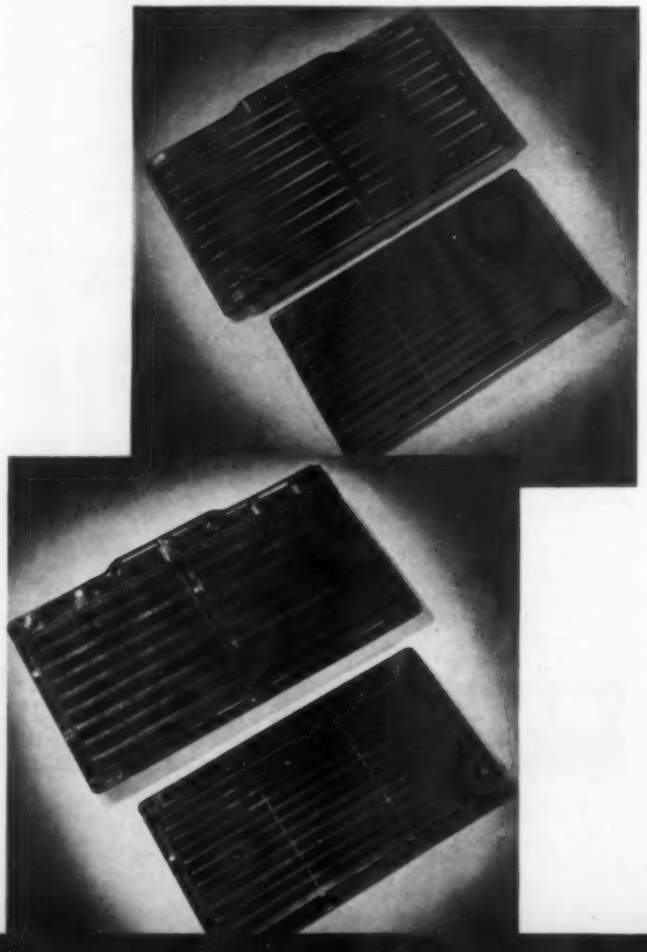
The grilles are molded for Cawthorne by Jersey Plastic and Die Casting Co., 74 Richmond St., Newark, N. J. The job is done in a Stokes press using two single-cavity dies made by Columbia Engineering Co., 119 Sussex Ave., Newark, N. J.

The larger grille measures $10^{3}/_{4}$ by $19^{1}/_{4}$ in., the smaller 9 by 16 inches. Thick ribs or supporting sections spaced 3 or 4 in. apart strengthen the outer walls and serve as strong points for knock-out pins.

Bakelite 14660 plastic is used to mold the grilles in 4-min. cycles—$^{1}/_{2}$-min. loading, $^{1}/_{2}$-min. run loading, and a 3-min. cure. Straightening blocks are used and no cooling is necessary before removing the grilles from the mold.

After molding, the flash between the bars is removed by hand filing and six blind mounting holes are drilled on the rear of each grille. Thus the grilles can be mounted on the machine from the rear, leaving no screws or bolts visible from the front.

Below are front and back views of two phenolic grilles used to give air conditioning unit a neat appearance



Model 2R2A

Red Headed Ruggedness

IN HIGH FREQUENCY HEATING FOR PLASTICS

FROM the very beginning of our pioneering work, THERMEX high frequency dielectric heating units have been noted for electronic muscle—the *rugged* way they're engineered for years of good service.

Backed by outstanding experience, new Model 2R2A THERMEX Red Head for plastics preheating is rugged in even greater measure than before . . . from heavy-duty steel cabinet to features offering every possible protection against functional misbehavior. These include protection of tube filaments with constant voltage transformer—automatic grid control circuit—plate overload relay—dust tight covers for all relays, contactors, switches, and similar circuit components—properly air conditioned heating compartment.

Like all THERMEX Red Heads, Model 2R2A is portable and compact in relation to capacity. Occupies only 3½ square feet. Heats 1½ pounds of general purpose plastic material from 80° F to a uniform 250° F in one minute. Accepts preforms up to 4¼ inches thick. Drawer-type heating compartment and automatic timer control makes it simple to operate. Keeps two presses busy with dual timers—can be started from press position if desired.

Write for information about the complete line of THERMEX Red Heads. The Girdler Corporation, Thermex Division, Louisville 1, Ky.

• • •

DISTRICT OFFICES

150 Broadway, New York City 7 • 600 S. Michigan Ave., Chicago 5 • 5614 Telephone Road, Houston 12

Thermex RED HEADS

THERMEX and RED HEAD—*T. M. Reg. U. S. Pat. Off.*

THE FIRST INDUSTRIAL HIGH FREQUENCY DIELECTRIC HEATING EQUIPMENT

Consumption of

PLASTICS RAW materials consumption rebounded in August from their former precipitate decline with almost unbelievable resiliency. Almost every category except miscellaneous molding materials (principally acrylics, ureas, polyethylene, and casein) and laminating resins made gains or held their own. Most sensational of all was phenolic molding powder which reached a total of almost 18,000,000 lb. and this in face of almost unanimous predictions that phenolics

PLASTICS AND SYNTHETIC RESIN CONSUMPTION
From Statistics Compiled by Bureau of

Materials
Cellulose acetate and mixed ester plastics[a]
Sheets
Continuous (under 0.003 gage)
Continuous (0.003 gage and upward)
All other sheets, rods and tubes
Molding and extrusion materials
Total
Nitrocellulose plastics[a]
Sheets
Rods and tubes
Total
Other cellulose plastics,[a, b]
Phenolic and other tar acid resins
Laminating (dry basis)
Adhesives (dry basis)
Molding materials[a]
All other, including casting (dry basis)[d]
Total
Urea and melamine resins
Adhesives (dry basis)
Textile and paper treating (dry basis)
All other, including laminating (dry basis)[d, e]
Total
Polystyrene[d, f]
Vinyl resins
Sheeting and film, including safety glass sheeting[a]
Textile and paper coating resins (resin content)
Molding and extrusion materials (resin content)
All other, including adhesives (resin content)[d]
Total
Miscellaneous
Molding materials[a, g]
All other (dry basis)[d, h]
Total
Grand Total

[a] Includes fillers, plasticizers and extenders. [b] Includes methyl and ethyl cellulose and related plastics. [c] Data cannot be published without disclosing operations of individual establishments. [d] Excludes data for protective coating resins. [e] Excludes urea and melamine molding materials; see footnote *g*.

plastics materials

were due for a decline. Vinyls, too, came bouncing along with an over-all increase of almost 1,500,000 lb. in August over July although unlike other plastics they had started on the way back up in July. The increase in vinyls included every category from paper coating to adhesives. Polystyrene went zooming back up into the 7,000,000-lb. classification again, and cellulose acetate and mixed esters showed a gain of more than 600,000 lb. over July.

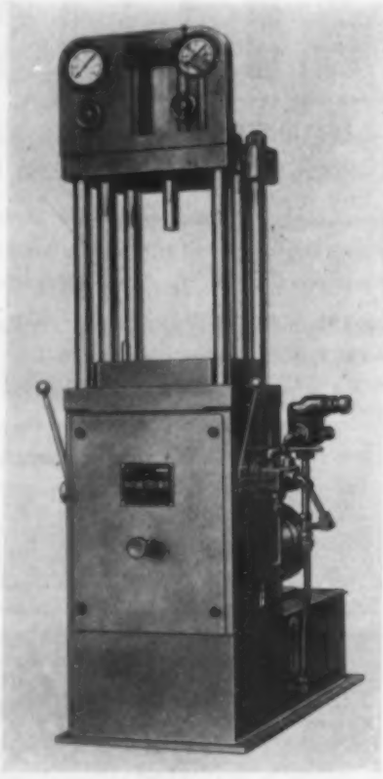
IN POUNDS FOR JAN. THROUGH AUGUST 1947
Census, Industry Division, Chemical Unit

July 1947	*August 1947*	*Total for first 8 months*
lb.	*lb.*	*lb.*
512,602	559,201	5,323,883
621,823	621,689	4,855,255
275,496	297,933	2,854,509
2,779,421[r]	3,409,455	40,797,454
4,189,342[r]	4,888,278	53,831,101
671,582	682,156	6,542,869
220,641	220,517	2,708,526
892,223	902,673	9,251,395
e	*e*	1,685,554[f]
3,146,258	2,711,686	26,962,660
1,521,047[r]	1,579,862	13,515,785
16,638,810	17,934,071	126,484,338
4,643,124	3,834,956	43,702,746
25,949,239[r]	26,060,575	210,665,529
3,887,083[r]	3,604,625	31,748,159
1,175,423	1,343,035	10,994,147
473,743	514,137	5,352,418
5,536,249[r]	5,461,797	48,094,724
5,687,761	7,074,880	53,624,249
3,721,930	4,105,498	39,334,777
1,537,288	1,649,818	10,398,688
4,567,317	4,826,062	46,066,283
1,746,715	2,335,582	17,631,699
11,573,250	12,916,960	113,431,447
4,118,342	3,600,678	37,800,457
1,700,395	1,663,299	17,891,765
5,818,737	5,263,977	55,692,222
59,647,801	62,569,140	546,276,221

/ Dry basis, including necessary coloring material. *e* Includes data for urea and melamine, acrylic acid and miscellaneous molding materials. [h] Includes data for petroleum resins, acrylic acid ester resins, mixtures and miscellaneous synthetic materials. [r] Revised. *f* Total, January through April only.

New Machinery and Equipment

Short-run transfer molding machine—A new light plastics molding machine designed specially for use with a new kind of hand mold to produce short run items by the transfer method has been added by Watson - Stillman Co., Roselle, N. J., to its line of hydraulic equipment. This machine is also arranged to receive automatic transfer molds and to perform a variety of compression molding and laminating operations. For limited production of general purpose, low and medium impact parts, a two-piece transfer hand mold is used which requires no bolster because the mold is removed from the press for loading and unloading. It is said that cost of such molds is less than that of compression and transfer hand molds formerly used.



Molding clamping pressure is supplied by a moving-up ram adjustable to any pressure within its 30-ton capacity. The transfer plunger is actuated by an independently adjustable down-moving ram of 10-ton capacity.

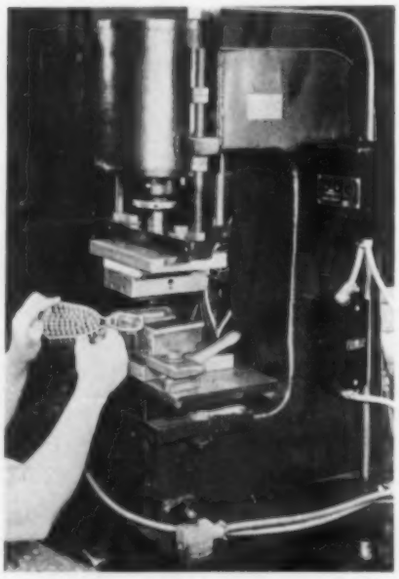
Provision of separately adjustable clamping and transfer rams is said to prevent flash at the parting line and around inserts by assuring a clamping pressure always greater than that within the mold itself. Platens of the machine are arranged to receive bolster and fixed transfer molds when the quantities to be produced are such as justify the higher mold cost of automatic operation. The machine is recommended for long-run multiple cavity molding of small parts on a production basis. It is instantly adaptable in its 30-ton capacity for conventional compression molding of high-impact thermosetting materials such as Rogers board.

Air motor—A reciprocating, non-rotating air motor, known as BM15, which has a $4^1/_4$-in. bore and develops a piston thrust of 15 times air line pressure from any given line pressure up to 175 p.s.i., has been added to the company line of air motors by the Bellows Co., 222 W. Market St., Akron, Ohio. The valve and all operating controls are integral with the unit. This motor is available in stroke lengths of $1^1/_2$ 3, 6 and 9 inches. Other stroke lengths may be obtained by special order. The BM15 is also available in many different styles—pivot mount, remote control pivot mount, solenoid operated, remote control solenoid operated, remote control manually operated, as well as the standard foot mount units.

Laminating machine—Haas Laminator Corp., 532 Craig Ave., Staten Island 7, N. Y., has announced a new laminator for cementing, by heat and pressure, a sheet of cellulose acetate film to any product made of paper. It is recommended for customers who wish to do such work on their own premises to insure quick delivery. This machine takes film from a roll continuously and coats one side at a time. An attachment is available which permits both sides of paper to be laminated at the same time. The standard speed of work through the machine is 7 ft. per minute. By changing the sprocket on the motor, this can be increased to 10 ft. or more per minute. At 7 ft. per min., about 400 sheets $8^1/_2$ by 11 in. can be laminated per hour. The machine will take paper up to 24 inches. Paper or cards up to $^1/_{16}$ in. can be covered without any adjustments.

Automatic punch press—A 12-ton high-speed automatic press with automatic roll feed and variable speed drive has been introduced by Di Machine Corp., 2711 W. Irving Park Rd., Chicago 18, Ill. This press accommodates standard die sets measuring to $8^1/_2$ by $6^1/_4$ in. or special die sets measuring to 8 by 12 inches. The shunt die height over the bolster plate is 6 inches. Stock to $4^1/_2$ in. wide may be employed and the length of feed is adjustable to 6 inches. The feeding mechanism provides accurate feeding for the use of progressive dies as well as for the use of blanking or compound dies. The variable speed drive permits operation of the press between 65 and 300 strokes per minute. Standard equipment consists of the press complete with clutch for single stroke operation, automatic brake release, hardened and ground feed rollers, knock-out bar in the ram, stock guides, motor and starter.

Air-powered production presses—Studebaker Machine Co., 1221 S. Ninth Ave., Maywood, Ill., has announced four models of Hurricane air-powered production presses for use with plastics, metals, ceramics, etc. They can be used for embossing, flanging, heat sealing, stamping, assembling, molding, laminating, crimping and for all light punch press jobs. Double acting air cylinders and continuous ram strokes make them suitable for push - pull broaching. By using the ram speed regulator, any ram speed is obtained from one slow squeezing stroke to 200 sharp staccato impact blows a minute.



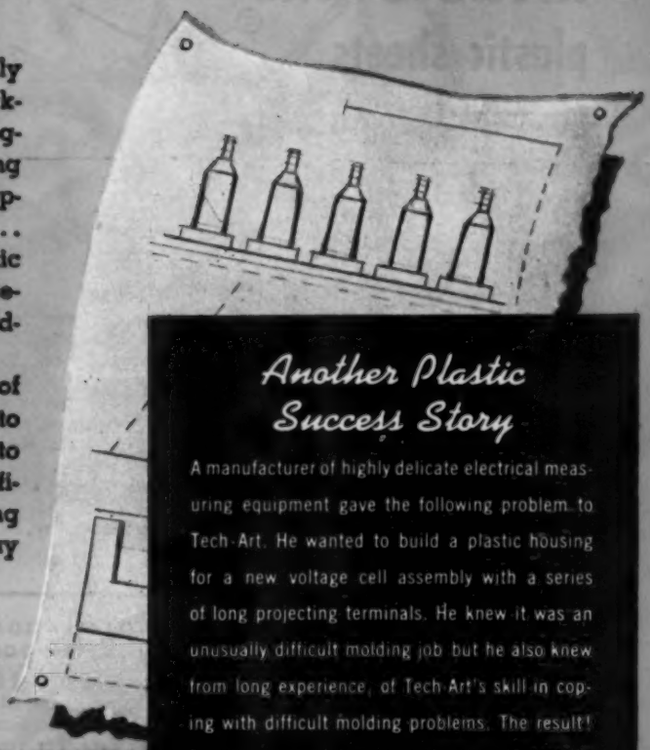
The ram stroke regulator sets the ram travel from a fraction of an inch to a maximum of 6 inches. For safety, double-acting all-steel air cylinders with $^1/_2$ and $^5/_8$-in. thick walls are used. Hurricane 3 has $^1/_4$-ton maximum ram pressure at 80 lb. air pressure; Hur-

See Your Ideas Molded...in PLASTICS

When you see and touch your idea, which has suddenly become through the wizardry of plastics, a tangible, workable and efficient reality, you will have come to recognize modern plastics as a highly developed, exacting science. For no plastic product, for example, can be properly developed without being soundly engineered first... without the greatest precision in the building of plastic molds... without the careful selection of the right materials to use... without pains and care in the actual molding itself.

At Tech-Art all of these factors of technical skill, of experience and craftsmanship together with facilities to produce every kind of molded plastic piece combine to make plastic success stories out of some of the most difficult and problematical assignments. If you are facing such a plastic enigma, a letter dropped to us today may save you time and money tomorrow.

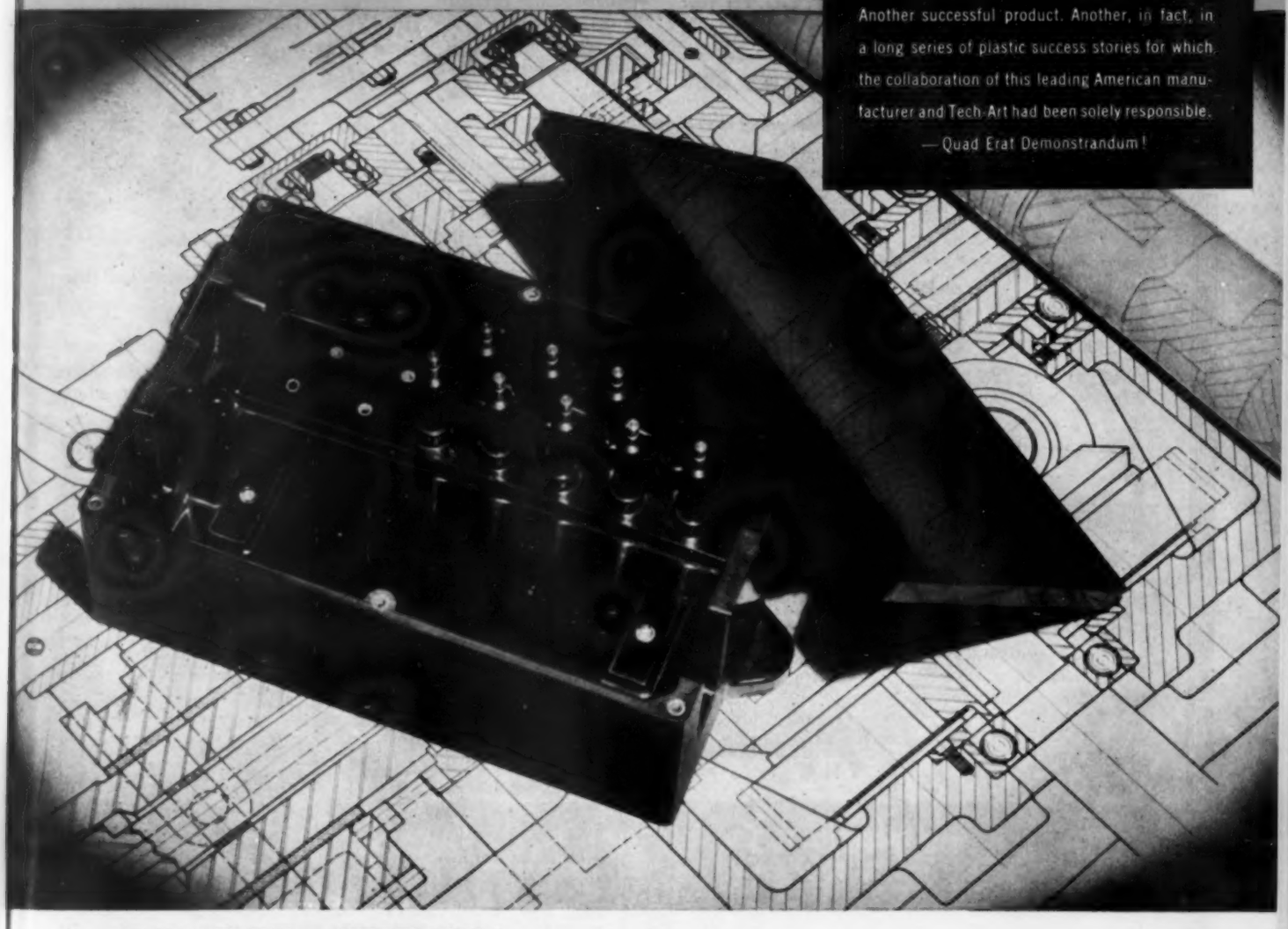
TECHNICAL NOTES: *The materials used in this molded piece were carefully selected for their electrical properties. The major problem involved was a particularly long flow of materials into deep narrow channels to provide a series of ten bosses to house as many closely assembled electrical terminals.*



Another Plastic Success Story

A manufacturer of highly delicate electrical measuring equipment gave the following problem to Tech-Art. He wanted to build a plastic housing for a new voltage cell assembly with a series of long projecting terminals. He knew it was an unusually difficult molding job but he also knew from long experience, of Tech-Art's skill in coping with difficult molding problems. The result! Another successful product. Another, in fact, in a long series of plastic success stories for which the collaboration of this leading American manufacturer and Tech-Art had been solely responsible.

— Quad Erat Demonstrandum!



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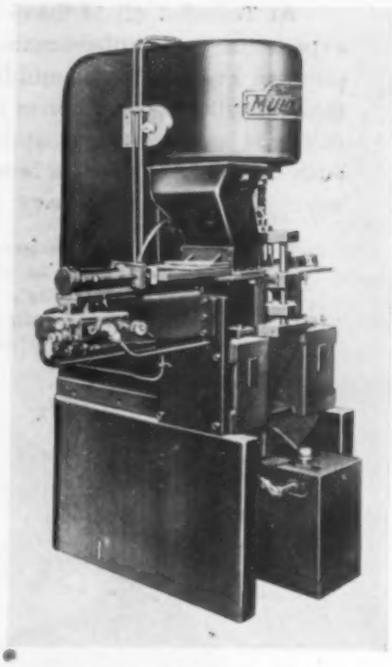
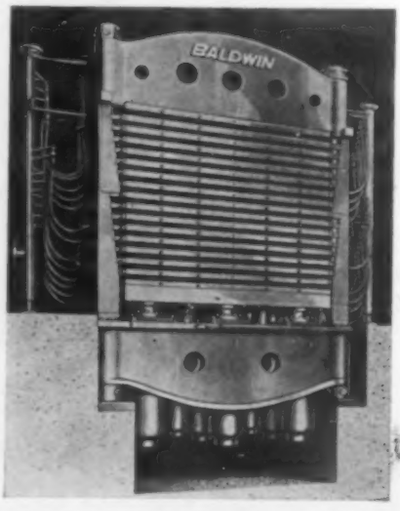
Machinery

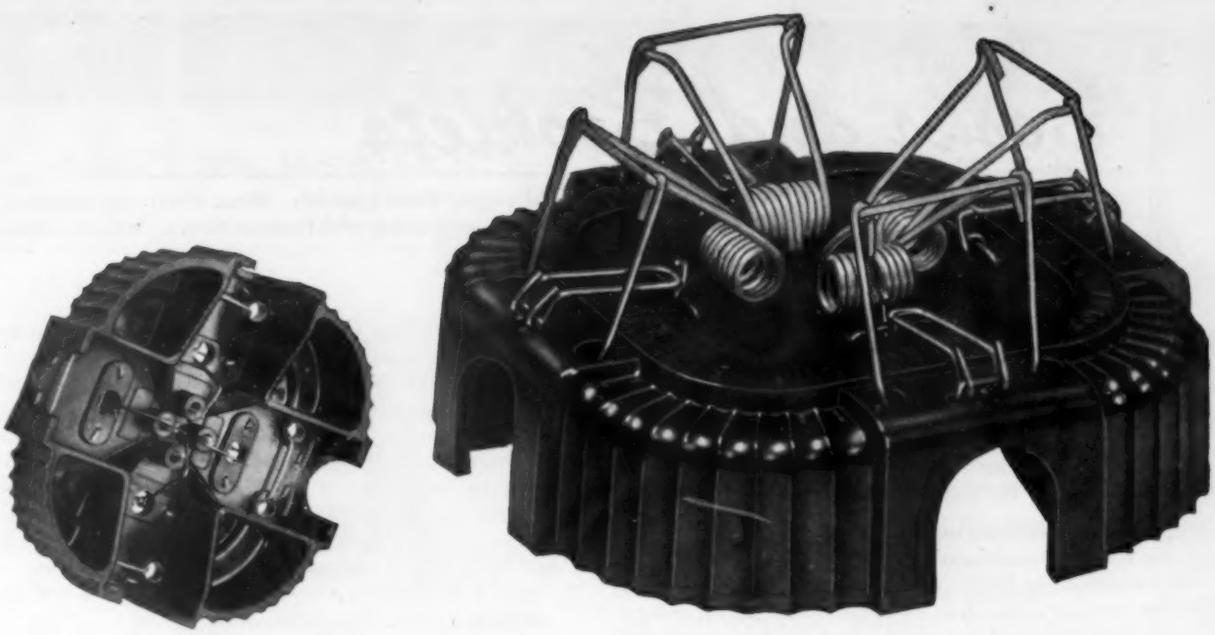
ricane 4½, ½-ton maximum ram pressure; Hurricane 6, 1-ton maximum ram pressure and Hurricane 8, 2-ton maximum ram pressure. In the illustration on page 170, a Hurricane 8 is being used to swedge nylon bristles into a hair brush.

Automatic pelleting press—A new automatic pelleting Multipress for use in plants processing powdered or granular forms of ceramics, chemicals, plastics or metals has been announced by the Denison Engineering Co., 1160 Dublin Rd., Columbus 16, Ohio. It is said to be able to process many materials formerly considered unsuitable for automatic production. Features include independent control of charging, compacting and ejecting ram actions and easy tooling for rapid die changes. All ram actions are fully automatic and completely interlocked. The company's Vibratory control principle is incorporated in this press in both the die charging and the compacting rams.



Steam platen presses—New steam platen presses for plywood fabrication have been announced by the Baldwin Locomotive Works, Philadelphia 42, Pa. These presses represent an effort to standardize on sizes so as to lower costs, yet the design is said to be sufficiently flexible to permit necessary alterations to meet the customer's exact specifications. They range from 78 by 54 in. to 130 by 66-in. platen size and from 250 to 1072-ton capacity. Features include: ample clearance to permit installation of a loader, sound basic construction capable of critical loads, steel columns with an adequate safety margin, precision ground ram for minimum frictional loss and steam plates of rolled steel which are drilled and ported for efficient circulation of steam.





Automatic Molding

BUILDS THAT "BETTER MOUSE TRAP"

This new plastics "Choker" Trap, molded by Animal Trap Company of America at Lititz, Pa., is further evidence that it pays to mold Automatically . . . that Completely Automatic Molding reduces labor cost . . . that it produces moldings of the highest quality, in quantities geared to daily production, at the lowest possible cost. These traps are molded on 50-ton Automatic Presses.

The advantages and economies of Automatic Molding are being demonstrated every day, in plants throughout the country. Hundreds of these presses are now in use.

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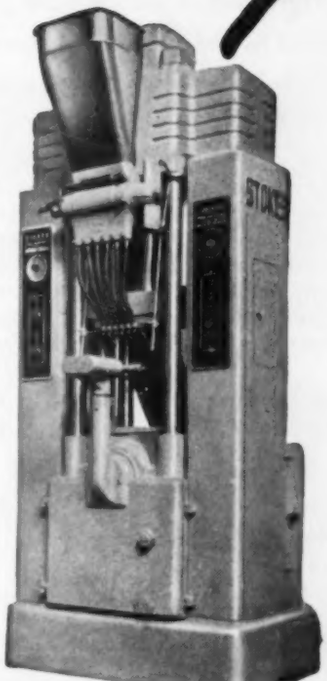
- In Automatic Molding labor cost is an insignificant fraction of the total per piece . . . one semi-skilled operator can tend a dozen or more presses.
- Output is high . . . up to 10,000 or more moldings per cavity per week. Parts are produced as needed . . . there are no large inventories.
- Mold cost is low because a few cavities do the work of many . . . molds are quickly made, quickly put into production.

You also save money many other ways when you can Mold Automatically. Let us show you. Send samples or sketches and state production requirements for cost estimates and recommendations.



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F. J. STOKES MACHINE COMPANY, 5934 Tabor Road, Philadelphia 20, Pa.

F.J.Stokes MOLDING EQUIPMENT

Books and Booklets

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Compounding Ingredients for Rubber, Second Edition

Compiled by editors of India Rubber World

Published by India Rubber World, 386 Fourth Ave., New York 16, N. Y.

Price $5.00 in U. S.; $6.00 elsewhere **640 pages**

Almost 2000 compounding ingredients for rubber are described in this new book, in comparison with 500 materials covered in the first edition put out in 1936. The present edition has also been extended to contain a section on raw materials, covering natural and synthetic rubbers and their latices, and synthetic resins and latices. The other two main sections cover dry rubber compounding materials and later compounding ingredients. The various materials are divided into groups under these sections and presented in alphabetical order. Each material's composition, supplier, properties, functions, and applications are given.

Textile Series—Report No. 13: Textile Microscopy in Germany

Published by Textile Research Institute, Inc., 10 E. 40th St., New York 16, N. Y.

Price $5.50 **147 pages**

Sets of photomicrographs reporting work done in the study of German synthetic textile fibers are presented in this report which was prepared by the Research and Development Branch, Military Planning Div., Office of the Quartermaster General. The original data were compiled by the staffs of the Zellwolle-Lehrspinnerei, Denkendorf, and the microscopic laboratory of I. G. Farbenindustrie, Hoechst. For comparative purposes, some photomicrographs of natural textile fibers are shown.

High Polymers: Vol. VII, Phenoplasts—Their Structure, Properties and Chemical Technology

by T. S. Carswell

Published by Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y., 1947

Price $5.50 **267 pages**

This book is Volume VII in a series of monographs on the chemistry, physics and technology of high polymeric substances, and covers both theoretical and practical aspects of the phenoplasts. An account of the history and development of phenoplasts is rendered, amplifying numerous theories of investigators. The author describes fully phenoplast chemical and physical structure in the light of current knowledge. Much of the data gained during recent years of research in this field are assembled for the first time under one cover, and the accepted structure of phenoplasts is correlated with their mechanical and chemical properties. Reactions of monohydric phenols with formaldehyde are discussed in detail and various reactions taking place during the curing process are presented. A convenient summary of the phenol-formaldehyde reaction is included. Phenoplasts from higher aldehydes and phenoplasts from polyhydric phenols are discussed in separate chapters. A chapter is devoted to oil-soluble phenoplasts; another chapter, by Donald S. Herr, discusses phenoplasts as ion exchange resins. A generous amount of space is allotted to the mechanical properties of molded and laminated phenoplasts.

Although this book is not intended to be in the nature of a handbook, comprehensive practical information is given on the use and effects of fillers in molding compounds and laminates, and on the technique of manufacture. A chapter on molding technique, prepared by Carl H. Whitlock, briefly describes compression, transfer and injection molding, and provides information on various molding practices. The final chapter is confined to a description of technical applications of phenoplasts.

Ample illustrations and literature references as well as author and subject indexes are also supplied.

Steam platen presses—The Baldwin Locomotive Works, Philadelphia 42, Pa., has just issued a new bulletin, No. 254, describing its line of Southwark steam platen presses. This 12-page bulletin contains pictures of the standardized line and custom-built presses along with specifications and uses of each.

Preheating equipment—Advantages of the company's Illitron high frequency dielectric preheating equipment which is used in the heating of plastic or rubber preforms for multiple cavity molds are described in a new bulletin issued by the Electronics Div., Illinois Tool Works, 2501 N. Keeler Ave., Chicago 39, Ill. The equipment's built-in electrodes, automatic timer, regulating circuit, and stepless output power control are discussed.

Coating of materials—A "paste dispersion method" used by the German coated fabrics industry to coat materials with plasticized polyvinyl chloride resins is described in a report recently put on sale by the Office of Technical Services, U. S. Department of Commerce. This report was prepared by Deforest Lott, technical director of Textile Leather Corp., Toledo, Ohio, and William D. Hedges, research director, Columbus Coated Fabrics Corp., Columbus, Ohio, following their investigation of 19 German coated fabrics firms. Materials made in Germany from paste applications ranged from lightweight coatings for upholstery and leather goods to shoe soling material.

Molds—A new bulletin tracing the development of the Peri-Cast method of casting cavities, forces and inserts has been released by Stainless Cavity Corp., Leominster, Mass. Various types of molds are shown.

Handling of polyvinyl chloride latex—A new service bulletin, 47-L2, on the handling and storage of Geon Latex has been published by the B. F. Goodrich Chemical Co., Rose Bldg., Cleveland 15, Ohio. The bulletin describes the proper equipment to be used in storing the latices and checks to make while they are in storage to insure maintenance of stability.

Polystyrene—The National Bureau of Standards, Washington 25, D. C., has made available publication RP 1801 entitled "Heats of combustion and solution of liquid styrene and solid polystyrene, and the heat of polymerization of styrene" by Donald E. Roberts, William W. Walton, and Ralph S. Jessup. It may be obtained for 10 cents.

Wire and cable insulating compounds, organosol coatings for textiles—Two new booklets have been put out by the Bakelite Corp., 30 E. 42nd St., New York City 17. "Kabelitems

A BUYING GUIDE FOR ABRASIVES

POINT No. 10

REPUTATION

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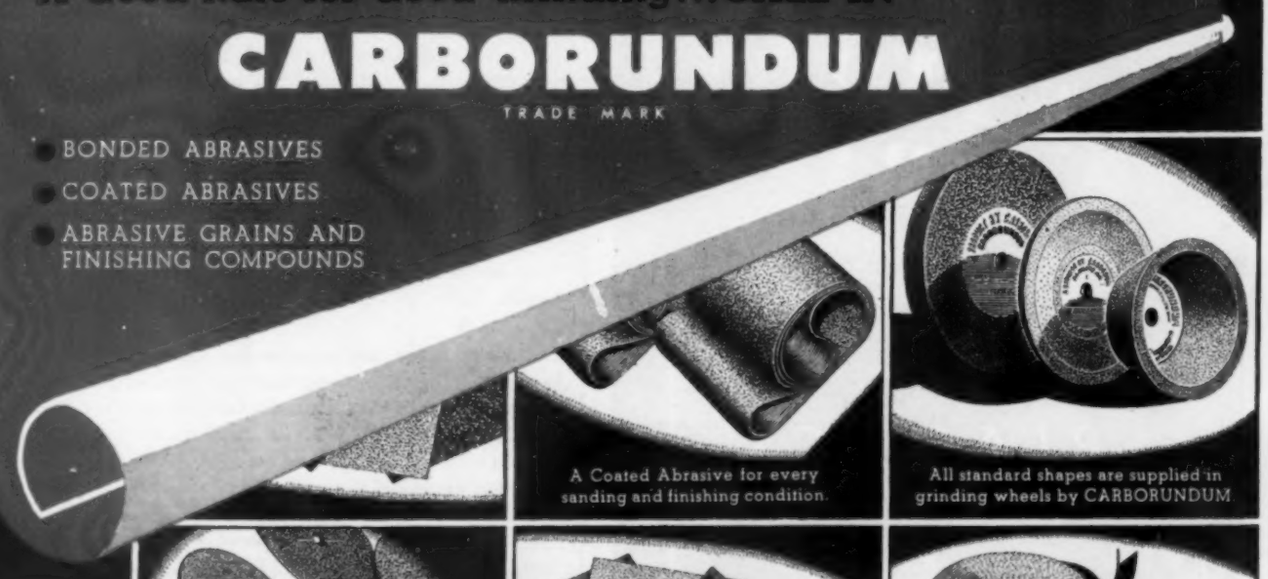

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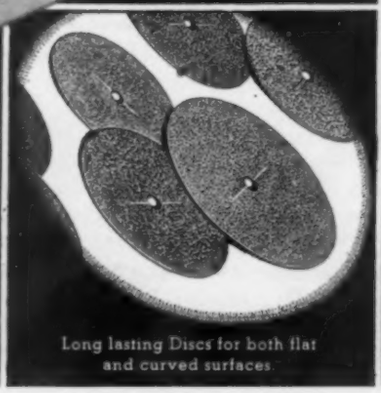

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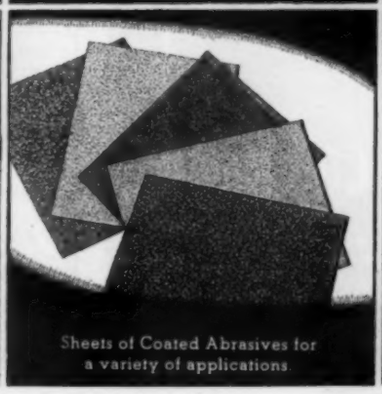
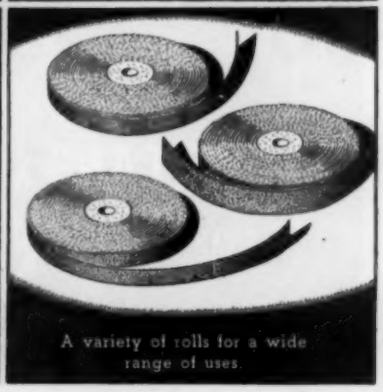


Sheets of Coated Abrasives for a variety of applications.



A variety of rolls for a wide range of uses.

No. 16" gives technical data on Vinylite brand plastic wire and cable insulating compounds. The eight series of Vinylite brand plastic insulating compounds are discussed. Included are tables which describe their physical and electrical properties.

Technical data on organosols based on VYNV 1 are presented in "Vinylite resins—organosols for cloth coating," the second Bakelite booklet. Contents include sections on coating procedure, general formulation notes, solvated organosols, grinding, storage, application, ovens, and baking.

Laminated vinyl floor tile—Plastile, the new laminated floor tile made from Tygon plastic, is explained in a new color folder put out by the United States Stoneware Co., Akron 9, Ohio. Specifications are included.

Acrylic displays—The use of Plexiglas in the display of many types of merchandise is the subject of a new illustrated booklet prepared by Rohm & Haas Co., Washington Square, Philadelphia 5, Pa. Among merchandising aids discussed are modern packaging, point of sale displays, show cases, and wall units for combination storage and display.

Injection molding equipment—The Fellows Gear Shaper Co., Springfield, Vt., has just released a pamphlet on its Fellows-Leominster molding machines, featuring a taper bore Speed-Flo cylinder and Taper-Tite separator. These two parts are said to permit a reduction in electrical heat wattage input by 15 percent, to give better heat distribution, to minimize burning and discoloration, and to increase output.

Cellulosic plastics—An elaborate and profusely illustrated booklet entitled "Cellulosic plastics No. 3" has just been published by the Cellulose Products Dept. of Hercules Powder Co., Wilmington 99, Del. Processes for coating plastics with metals, uses for nitrocellulose plastics, ethyl cellulose and cellulose acetate are discussed. One section deals with electrical properties of these materials; another with new cellulose derivative, CMC.

Injection molded products—F & F Mold and Die Works, 103 Sachs St., Dayton 3, Ohio, has issued a pamphlet showing the variety of products it is able to turn out in its plant. Work includes product design, model making, mold building, injection molding, assembly, painting, and finishing.

Use of phenolic resins—A four-page bulletin outlining the various Durez resins and their uses in the rubber industry has been issued by Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y.

Cellulose ester thermoplastics—A revised edition of the booklet, "Tenite," concerning the company's cellulose ester thermoplastics of the same name has been published by Tennessee Eastman Corp., 10 E. 40th St., New York City 18. The present edition runs to 32 pages and contains 100 illustrations of Tenite products—many of them in color to play up the material's luster and range of transparent, translucent, variegated and opaque colors. The booklet deals with what Tenite is, how it is made, and the kinds of applications for which it is suitable. Physical properties are enumerated.

Milling report—Model building, die making, and the L-1 method of surface broaching are discussed in Vol. 4, No. 3 of "Report from Cincinnati milling" issued by Cincinnati Milling Machine Co. and Cincinnati Grinders, Inc., Cincinnati 9, Ohio.

Surface pyrometer—Catalog No. 160, issued by the Pyrometer Instrument Co., 103–105 Lafayette St., New York City 13, describes Pyro, a surface pyrometer with interchangeable extension arms and thermocouples. The various types are explained along with proper usage.

The Plastiscope*

INTERPRETATIONS OF THE CURRENT NEWS

BY R. L. VAN BOSKIRK

The phenolic situation

Phenolic molding powder and laminating varnish are currently holding their own, and consumption is expected to increase each of the remaining 1947 months.

After a record consumption of over 17,000,000 lb. of phenolic molding powder in June, consumption fell off to a little over 16,000,000 in July due to a slight decline in demand and also to vacation periods and shop shutdowns. August consumption was back up to almost 18,000,000 pounds.

Last year and early this year customers were obtaining about 30 percent of the material they asked for, and suppliers were forced to allocate their production. But it is now possible for a customer to order any amount he wants and to expect reasonably prompt delivery. It is believed that all inflated and excess inventories have been eliminated from the market and that production is now in line with requirements.

The increased quantities of phenol formaldehyde molding powders were made possible when raw materials, including formaldehyde and phenol, became more available.

More furfural used—The increased use of furfural also aided production to a considerable degree. Phenol furfural resins have been used for many years to produce molding powders and are known to be advantageous for many purposes. To accommodate raw material shortages, producers have been using these resins to a considerably greater extent than ever before. Equivalent curing cycles can be obtained by using somewhat higher molding temperatures.

One reason that may lead to a slight decline in demand for phenolics seems to be a surplus supply of radio cabinets, cooking utensil handles, electric iron handles, and fluorescent sockets where phenolics have been used in great quantity. The market is now supposed to be saturated with these products, with a consequent decline in orders for phenolic parts.

The radio cabinet superfluity is expected to continue until manufacturers start bringing out more of the $15 to $20 sets again. Phenolic suppliers are not much concerned about losing any great portion of this market to thermoplastic materials and insist that wood cabinets will never be able to compete with phenolic in low-cost radio sets. They point out that phenolic cabinets will always have a predominant place in the market because of their low cost and their more stable characteristics such as, for example, less distortion and more heat resistance.

Wiring devices lead output—As usual, phenolic wiring devices still require the major portion of phenolic molding powder output. The demand for such devices is still holding up, but there is far less confusion in the field because material to make them is now available.

In addition to wiring devices, the following items continue to consume substantial quantities of phenolic molding material: bottle caps, telephone hand sets, industrial electrical appliances, and auto parts.

The number of washing machine agitators now produced in phenolic has far more than doubled since before the war. It is also believed that larger molded pieces will start coming to market within the next year or two. There was a trend in that direction immediately following the war, but it was cut off because the use of high frequency heating for quick cure and more rapid plunger and transfer molding made it possible for molders to turn out small pieces so fast that they never got around to changing over to larger pieces. They will be doing more experimenting in the next year now that raw material is more readily available. There have already been experiments with such things as washing machine tubs, automobile body parts such as the lid for the trunk compartment, etc.

Molders increase—The number of molders in the field increased from somewhere around 500 in 1940 to approximately 700 in 1945, with another hundred added in 1946. In 1947 there was a very slight drop. It is estimated that about a third of these molders are non-trade artisans, such as the electrical manufacturers and others who mold for their own consumption.

Phenolic laminates

High pressure laminators are now using between 5,000,000 and 6,000,000 lb. of laminating varnish (60 percent solids) a month. This compares to an average of a little more than 3,000,000 at the same time in 1946. The high month in 1947 was about 6,000,000 in May, with a low of about 4,000,000 in February.

There has been considerable talk about things slowing up in the laminating business, but regardless of that talk, laminators have been using enough varnish to indicate that the industry will produce about 60,000,000 lb. of finished laminate in 1947, in comparison to a high of 80,000,000 during the war. Before the war the industry never produced more than 25,000,000 lb. in a year.

Laminators' squeeze—A shakedown in the industry has eliminated many operators who went into business during the war. It has been reported that there were around 90 manufacturers making laminates in some form or other during the war, but that figure has dropped considerably. The number of high pressure laminators is now almost identically the same as it was in the prewar period. The ups and downs in the industry since the elimination of war controls have been due largely to strikes and a change in the pattern of business between industrial and decorative laminates. There is no question but that there has been a decline in decorative laminates, but the increased market for industrial laminates has kept the over-all production at a comparatively high rate. Most laminators feel that business in decorative laminates will pick up shortly.

The last word obtainable from producers is that September orders for all laminating varnishes ran far ahead of August; that October was better than September; and that there is no apparent reason to anticipate a slump at any time during the balance of 1947.

Marvinol production

The Glenn L. Martin Co. will start producing vinyl resins at Painsville, Ohio, within the next few weeks. For several years they have been producing resin at a pilot plant operated in cooperation with the Case Institute of Technology.

Annual capacity will be 25,000,000 pounds. The firm expects to reach that rate of production in the late spring of 1948 when the second half of the plant will begin operation. The first half is scheduled to go into steady production this month (November). Shakedown runs are being made at present.

The company will produce a group of products that will include a series of vinyl resins, plasticizers, and stabilizers. All will carry the trade-name of Marvinol.

What is it?—Marvinol is described as a polyvinyl chloride type although the company will not disclose its exact chemical composition. They assert that it has a

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higher molecular weight than any similar type resin, but despite this factor it is said to be as easy to process as lower molecular weight polymers, to give a tougher film, and to be more heat stable in processing; therefore it supposedly has greater color stability. Developers claim that it will give a drier hand than competing resins using the same amount of plasticizer.

In addition to its inherent heat stability, another strong point claimed for the first of the Marvinol resins is low temperature flexibility. Developers also point out that it is one of the most versatile resins yet announced to the industry: they say it will do more things than any other single resin—can be calendered, extruded, used for rigid sheets, or made into dispersions that can be used either with or without a diluent.

The company will produce raw materials only and will not fabricate end products from vinyl resins.

National S.P.E. Conference

The National Conference of the Society of Plastics Engineers will be held at the Horace H. Rackham Educational Memorial, Detroit, Michigan, January 21–23. Participating companies, clients, and engineers who desire them will be allotted one or two 10 ft. by 10 ft. spaces where they may hold conferences concerning their products and exhibit new materials or specific applications if they wish. This is in no sense an end product exhibition and S.P.E. officials emphasize that they will discourage any exhibit of a general nature. It is strictly a technical meeting, and the conference spaces are provided as a means for technical men to get together with their clients and other interested parties to talk over operating and development progress of their various plastics products. Current moving pictures on plastics subjects will be shown in the afternoons.

The meeting will be open to S.P.E. members and to invited non-members only. R. G. Dailey of Wolverine Plastics, Inc., Milan, Mich., is general chairman.

Borden buys Durite

Durite Plastics, Inc., of Philadelphia, has been sold to the Borden Co. The transaction, which involved an exchange of stock valued at approximately $3,000,000, will considerably broaden the plastics activities of the Borden Co. through its Casein Co. of America Div. which is already an important supplier of plastic adhesives. This latest move now establishes the company as an important producer of phenol-furfural, phenol-formaldehyde thermosetting resins, varnishes, molding compounds, and other derivatives for industrial use.

Effective immediately, the new acquisition will be known as the Durite Plastics Div. of the Borden Co. Emil E. Novotny, president of Durite, will continue to direct the activities of Durite. Other executives and operating personnel will remain unchanged, according to Borden vice-president, William F. Leicester.

Under the terms of the agreement, Borden's has purchased the Durite office and plant facilities at 5000 Summerdale Ave. in Philadelphia. This includes 18 buildings on a 13-acre tract of land and additional laboratory space.

Durite has been in the synthetic resin field since 1916 and has pioneered in the development of furfural resins, resorcinol resins, and other thermosetting resins and their derivatives for special industrial uses.

Borden's entered the synthetic resin field in 1936 when its Casein Co. of America Div. expanded its operations beyond the production of casein adhesives to include all types of plastics adhesives.

Acetate price reduction

Tennessee Eastman Corp. announced a 5 cent per lb. price reduction in cellulose acetate translucent colors and metallic pearls on October 21. Transparent colors are not included in the price reduction. The price on translucent colors in lots of from 5000 to 29,999 lb. is now 44 cents in comparison to a former price of 49 cents. In over 30,000 lb. lots, the price is now 42 cents. There was no reduction in the price of cellulose acetate butyrate, but the company has added to both acetate and butyrate a limited number of dark colors which are made from processed scrap. They are opaque in thicknesses of 0.050 in. and are available at the same price as reprocessed blacks which were formerly termed regular grade blacks.

Wall tile association

A meeting of plastic wall tile manufacturers and suppliers was held in Chicago on September 18 to organize a Plastic Wall Tile Manufacturers Institute, under the chairmanship of Walter E. Jacobson of Yardley Plastics Co.

Harry A. Hachmeister, of Hachmeister, Inc., was elected president; Joseph Mass of United Distributors, Inc., vice-president; H. Wm. Brandt of Plastic Molded Products Co., secretary; and Al M. Harris of Harris Tile Co., treasurer. The next meeting was scheduled for New York City on November 3. McClure, Hadden and Ortman, Inc., a Chicago engineering firm, has been employed to organize the institute and help guide it through the initial stages.

Applications for membership were received from 14 of the 21 manufacturers represented, and others stated that their applications would be submitted after approval of company officials.

Qualifications—Two classes of membership were approved for eligibility; namely, manufacturers and suppliers. Manufacturers include: a) Those who own their own machines and molds; b) Those who own their own molds with the molding done outside the owner's plant; c) Those who manufacture tile otherwise for basic distribution.

Suppliers include those who provide basic and supplementary materials, and the tools.

Manufacturers will pay an initiation fee of $250, plus dues of one-half of one percent of their gross volume of business in the plastic wall tile field. Suppliers will pay no initiation fee but will pay dues on the same basis as manufacturers.

Building code standards—First on the agenda is the development of acceptable product standards which will result in Federal Housing Administration approval and can be adapted by the various municipal building codes.

Suppliers in attendence at the meeting represented the Monsanto Chemical Co., the Armstrong Cork Co., the Dow Chemical Co., the Vaughan Paint Co., Maston Laboratories, Koppers Co., Inc., and the Benjamin Foster Co.

Stove market

The Gas Appliance Manufacturers Association has lined up a million dollar advertising campaign for this fall. Half of the gas ranges in use are more than 10 years old and ready for replacement, they say. Many gas stoves have as much as 20 oz. of thermosetting molded parts used in handles, knobs, dials, and fittings.

Packaging film

A clear, tough, flexible packaging film cast from a colloidal dispersion of polyvinyl chloride plastic in water has been announced by the Reynolds Research Corp., Gary, Ind. Called Reynolon, the new film is made from Geon latex and is the first free film made from this material.

Reynolon is suited for food packaging and protective coverings of many types. It can be sewed or electronically heat sealed and is available in gages ranging from one to three mils and in widths from 36 to 46 inches. The new material has good light and heat stability and excellent resistance to moisture-vapor transmission; its film thickness can be controlled to plus or minus 0.0001 in., which is important in

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heat sealing where uniformity is an absolute necessity.

Pepped-up S.P.E. meetings

In an effort to increase enthusiasm and attendance at S.P.E. meetings in Cleveland, M. Scott Moulton, president of the Cleveland Section, has notified the members that they can expect less speech-making and more chin-wagging at this year's group affairs. He believes that it is frequently possible to get more out of a meeting from side conversations than from the speakers.

Favors and door prizes are also offered as additional inducements to obtain better attendance. Mr. Moulton says more time will be devoted to talk among those present, so that a member will not have to spend a whole evening listening to one particular subject in which he may not be too interested.

Firestone plastics

A new subsidiary company of Firestone Tire and Rubber Co., called the Firestone Plastics Co., has been organized with Roger S. Firestone as president. Headquarters of the new company will be in Akron, Ohio.

The Firestone company's new plastics laboratory has recently been added to the new producing units installed in the Pottstown, Pa., plant during 1946 and 1947. In this plant, Velon plastic filaments are extruded for use in upholstery fabric, and Velon sheeting and film are processed.

The Paterson, N. J., plant mixes, extrudes, and fabricates film for insect screening and clothesline.

Beta-propiolactone

An important announcement pertaining to a new organic chemical came from the B. F. Goodrich Co. at the recent annual meeting of the American Chemical Society in New York. The name of the new chemical is beta-propiolactone and its developers assert that the ability to manufacture it is almost as epoch making as was the discovery of acetylene over half a century ago.

Beta-propiolactone is a coal tar chemical manufactured by combining ketene and formaldehyde, ketene being a chemical made from acetic acid or acetone. The principal use of the new product will be as a basic intermediate in the manufacture of other chemicals: now, for the first time in chemical history, commercial production becomes possible of a whole series of organic chemicals heretofore regarded as laboratory curiosities. Besides this, beta-propiolactone promises to open up new and cheaper reaction methods of producing many other basic materials already used in the chemical and plastic industries.

Three advantages—The advantages of this material are: 1) It offers a means of preparing organic compounds already on the market at a potentially lower cost than at present. 2) It offers the possibility of manufacturing chemicals now impossible to produce by any other methods. 3) New compounds never before made can be developed from the new material.

Substances which may be made from beta-propiolactone range from the liquid used in setting permanent waves to materials used in leather processing. Other fields in which it is expected to contribute either better or more economical products include: thermosetting polyester resin products which can be made tougher and less brittle; polymerizable esters for plastic products such as acrylic esters and co-monomers which may be used in new types of synthetic rubber; better types of nitrile rubbers.

Scotch plastics tight

Although the plastics industry in Scotland is still worried over a shortage of raw materials, it is even more concerned for fear that the industry will expand to a level which exceeds consumption demand, according to a Scottish correspondent.

The Scotsman is in a dilemma. He says that if Britain does not get another dollar loan and imports have to be cut, there will be an acute raw material shortage; but if they get more dollars permitting ample raw material imports, they will have overproduction of finished plastics products within two years.

This same spokesman complained that the export market is getting more difficult due partly to other countries' import restrictions and partly to the United States' starting to dump. There are 30 raw materials firms, 200 molders, and 40 fabricators in Great Britain. At the British Industries Fair, 80 manufacturers had products on view, four times as many as in the 1939 show.

Australian plastics

According to a recent visitor from Australia, the thermoplastics section of the plastics industry Down Under is just beginning to make headway. Very little acetate or any other thermoplastic was available during the war; and since the war only limited supplies have been available except for polyvinyl chloride from England. Imported thermoplastics are just coming in in sizeable quantities.

The thermosetting industry in Australia is fairly well established. There are from four to five resin plants turning out phenol-formaldehyde compounds for plastics at a rate of about 2500 tons a year. One plant is producing urea-formaldehyde now and another will come in later in the year with sufficient capacity for Australian requirements.

The tar oils, from which most of the phenol and cresol used in Australia is obtained, come from the Australian Gas Light Co. The synthetic phenol producers obtain their benzol supply in Australia. Their own caustic soda is produced locally, and two formaldehyde plants contribute to the basic raw material substance of the plastics industry.

Our informant advised that there are approximately 205 molders in the country —not quite half of whom use thermoplastics—and that there are less than 40 injection presses in the entire country. There is no manufacturer of injection presses in Australia. However, our informant claims that there is an Australian electronic pre-heater which he thinks is equal to those he has seen in America.

There are several thermosetting extruders of rigid piping, which has many uses in Australia, and a considerable number of casein extruders. In all, there are perhaps 20 plastic extrusion machines in use besides those used by the rubber industry. As in the United States, the principal output of the thermoplastic extruders has been cable or wire covering.

There are two companies processing calendered vinyl film or coating material in Australia. They have had primarily only polyvinyl chloride in the dry and paste form from England, but are now beginning to get good quantities of vinyl copolymers from the United States.

There has always been a good-sized pyroxylin coated industry in Australia and a great deal of rubber coating. It is assumed that many of these companies will soon get into the vinyl film and coating business.

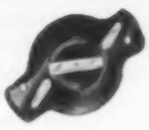
Spinach department

Examples of misinformation, carelessness, and pure ignorance on the subject of plastics are portrayed by recent press releases as follows:

One press release on behalf of a hearing aid spoke of a "transparent Lucite tube" which turned out to be vinyl. Another press release on a radio set spoke of a "Lucite dial" which actually was polystyrene.

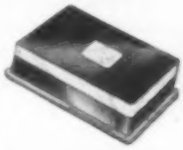
Perhaps the prize winner for the month was the press release from the representative of a trade group which has a product to sell to the chemicals industry. In the course of the buildup, the release announced that a new plastic of some unpronounceable substance is produced al-

MECHANICAL strength can be added to molded parts without burdensome weight. Fastening inserts, or structural reinforcements, are light, strong; available in many cases from stock.

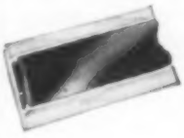


ELECTRICAL conductivity of aluminum is high. Perhaps you're thinking about a molded plastic electrical part where aluminum inserts provide the necessary conductivity. They're strong, too!

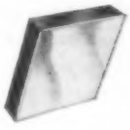
THERMAL properties of aluminum are excellent. Let's say you're designing a plastic product which must be air-cooled. You might use aluminum discs, molded in, as above.



DECORATIVE values of aluminum are a long story in themselves. Use it plain, or with frosty or mirrorlike Alumilite or colored finish (patented process). Remember, it's light!



EXTRUSIONS of plastic combined with extrusions of aluminum? Why not? One supplements the other, in beauty and strength. Alcoa Aluminum is available in many stock shapes.



LAMINATED plastics can be faced with aluminum sheet for a new idea in modern materials. Or, why not inset Alcoa Aluminum decorations in your dark laminates? Attractive!

FORMED plastic sheets team up well with Alcoa Aluminum, as in this navigator's dome. The whole assembly is light, strong, easy to mount. Is there a household idea here?

CHEMICAL properties of aluminum supplement those you like to stress in plastics. Can it help you in products for textile, process, petroleum, pharmaceutical, food industries?

We are specifying Alcoa Aluminum for all metal inserts

Has Your Competitor Discovered Something?

More and more, plastic users and molders are specifying Alcoa Aluminum for every metal insert job. Competitors of yours may be among them. Let's see what kind of an "edge" this gives them . . .

To begin with, their inserts cost less. They get three times as many per pound, for a pound bar of Alcoa Aluminum is three times as long as a pound bar of heavy metal.

And, in molding, there are no worries about expansion cracks around the aluminum insert. Open the mold, cool the piece, and the aluminum insert contracts at the same rate as the plastic. Nature made it that way. Stresses, cracks, rejects are minimized.

In low cost, in high production, and for handsome appearance, light weight, and chemical and electrical properties—wherever a metal is combined with a plastic, you'll find that *Aluminum-Plastic Teamwork Pays Off!* ALUMINUM COMPANY OF AMERICA, 2175 Gulf Building, Pittsburgh 19, Penna. Sales offices in principal cities.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM

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most every day and guaranteed to last a lifetime. According to the publicity, nylon, that magic word to women, gave birth to the modern plastic craze. That old "grandpappy nylon," the press agent calls it and, of course, he infers that the use of his material in the manufacture of nylon is one of the primary reasons for that plastic's existence. It is significant that no one from du Pont had ever seen or heard of these various press releases.

When misinformation like the above is passed around, how is the public to know when the information given them is accurate? How about a class on plastics publicity for publicity men who throw it blithely around?

Plastics in the South

An interesting booklet entitled "Facts in Figures about Atlanta," published by the Atlanta, Ga., Chamber of Commerce, has crossed the editorial desk with more than the usual amount of attention. For all those interested in marketing or locating in the South, this booklet is a valuable statistical reference. It gives printed evidence of the world's awakening to the resources of the South and asserts that half of this country's industrial development in the last two years has been in the South.

Nash-Kelvinator plant

A Plastics Div. of Nash-Kelvinator Corp. has been set up in the Milwaukee plant and is already in production on large injection molded parts for refrigerators, according to R. A. DeVlieg, vice-president in charge of manufacturing. W. F. Poupard will supervise the Milwaukee activity.

The plant, covering 33,000 sq. ft., now has about 50 employees, and this number is expected to be increased to about 125 by Spring.

Plastic boats for Navy

Six motor boats made of plastic and 88 of plywood, representing the first post-war changes in Navy small boat design, have been ordered by the Bureau of Ships for experimental use and testing. Both types are for personnel use.

The experimental plastic boats, the first designed for heavy duty in open seas, will be 28 ft. in length—twice the size of plastic commercial models now in use.

If found practical for Navy use, the principal advantage of the plastic boats would be in their adaptability to inexpensive mass production. Another possible advantage would be the fact that pigment manufactured into the plastic is designed to obviate the necessity of painting.

The six plastic motor boats are being made by the Marco Chemicals, Inc., and the Winner Mfg. Co., Inc., both New Jersey firms.

Results of other recent Navy interest in the plastic field will be known when plastic piping and honeycomb-core bulkheads now on order by the Bureau of Ships have been tested.

Foundrymen's plastic patterns

Plastic patterns will be used for the first time in the national apprentice contest of American Foundrymen's Association this year. Indentured apprentices throughout the United States and Canada compete annually in iron, steel, and non-ferrous molding and in pattern-making for cash prizes and certificates offered by AFA. The plastic patterns will be used in the non-ferrous molding competition.

Protecting window displays

C-Thru Products Co., 69 Lincoln Park, Newark, N. J., has announced a new material for protecting window displays from sun rays. Developed by the Infropake Corp. of America at 749 Atlantic Ave., Brooklyn, N. Y., it is called Infropake and is said to keep out both ultraviolet and infrared rays without interfering with visibility. It was originally developed as a material to enable anti-aircraft gunners and plane spotters to shield their eyes from the sun.

Developers claim that Infropake transmits 84 percent of the visible light but cuts out almost all ultraviolet rays and 85 percent of the infrared rays. It has never been particularly difficult to keep out ultraviolet in the past, they say, but keep-out infrared rays has been a problem.

The material is "almost clear, with a very slight green tint" and will be available in sheets ranging from 0.002 to 0.010 in. in thickness and in rolls up to a width of 48 inches.

RAW MATERIALS

Natl. Bureau of Standards' casting resin: A technical symposium on the Bureau of Standards casting resin developed by the National Bureau of Standards for potting high frequency radio equipment was held in Washington October 16. The resin, primarily designed for potting high impedance, high frequency electronic equipment, reportedly gives unusual ruggedness, moisture-proofing and circuit stability.

Southland pine tar and pine tar oil prices were reduced $^1/_2$ cent per gal. by Godfrey L. Cabot, Inc., of Boston for the fourth quarter of 1947. At approximately the same time, the company announced that carbon black had gone up from a fraction of a cent to 2 cents per pound.

Ethylene urea has been synthesized by a new process just made public by Drs. John F. Mulvaney and Ralph L. Evans of the Evans Research and Development Corp., New York City. Uses for ethylene urea have been reported particularly in the field of high polymers where it can be found helpful in preparing compounds that aid as finishing agents for textiles and leather, for crease-proofing textiles, and in the formulation of plasticizers, lacquers, and adhesives.

Polystal, a German adhesive used in aircraft construction and unaffected by cold or boiling water, hot and humid air or other atmospheric conditions, mold, or bacteria, is described in a report on German materials issued by the Office of Technical Services, Dept. of Commerce. Another plastic material used for aircraft tooling—a resin stabilized wood veneer product called Pressholz—which consists of a number of layers of thin beech veneer, cross banded and bonded by either Tego film or liquid resin, is also described in the same report. The latter material resembles Compreg except that it has a much lower resin content and thinner layers of veneer.

Several other plastics are described in this report. Copies may be obtained by ordering "PB 36853; Plastic and wood for aircraft tooling and fabrication," (photostat $3; microfilm, $1; 38 pages), from the Office of Technical Services, Dept. of Commerce, Washington 25, D. C.

Resins for paper base plastics: A report describing American wartime research in which resins were combined with high strength paper to produce laminated products formed by hot pressing is now available from the U. S. Government. Among the types of resins tested were phenolics, urea-formaldehyde, urea melamine, melamine, furans, vinyls, cellulose ethers, cellulose esters, chlorinated rubber, and others. Orders for the report, "PB 79543; A study of resins for use in paper base plastics," (photostat, $2; microfilm, $1; 24 pages), should be addressed to the office of Technical Services, Dept. of Commerce, Washington 25, D. C.

S-Polymers, new thermoplastic saturated hydrocarbon resins derived from petroleum, and which show unique advantages when blended in phenolics, or used to produce film, were discussed in a paper given by chemists of the Standard Oil Development Co., Elizabeth, N. J., at

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the annual American Chemical Society meeting.

These new S-Polymers are not to be confused with Perbunan, New Jersey Standard's nitrile rubber, and are described as styrene based polymers that are worth watching in the future. The company is not yet willing to describe them in any detail but it is known that they are being developed particularly for fruit and vegetable packaging use when it is necessary to prevent passage of excess water vapor or excess gases.

COMPANIES

Elmer E. Mills Corp. will soon break ground for a new plant to be located at 2912-38 N. Ashland Ave., Chicago, Ill. It is expected to be ready for occupancy by early summer 1948. The building will be a well-lighted, one-level plant with 50,000 sq. ft. of floor space, with equipment so arranged that raw material may be brought into the plant and moved in a "small circle" as it passes through molding and finishing operations to final shipment. Tool room, stock room, finishing room, etc., will all be immediately adjacent to the molding room.

Werner Extruded Plastics Co. has set up an extrusion display on the ground floor of its plant at 380 Second Ave., New York City. It has fitted the room with one machine and all facilities necessary for lecturing in order to demonstrate the versatility of extrusion machine operations. Any materials manufacturer who wishes to cooperate is invited to do so. Demonstrations will be by appointment, and only small groups will be arranged.

Polyprint Fabric Corp., Room 729, 152 W. 42nd St., New York City, is prepared to put a broadcloth or suede finish on unsupported vinyl film of any gage and also on plate polished sheet. At present, width of sheet is limited to 44 in., but equipment will soon be added to take care of a 54-in. sheet. The suede finish can be supplied in any color or in contrasting colors. Company officials state that the suede finish helps prevent migrating of the plasticizer to varnished surfaces; prevents slipping; minimizes stretch; helps prevent tear when the finished sheet is sewed; and that the suede finish has an affinity for glue. The flock or suede finish adds from four to eight gages to the thickness of the sheet.

Company officials state that they are in a strictly custom molded business and are ready to process vinyl film for any customers who wish to have a suede finish which is particularly applicable for use in shoes, handbags, automobile upholstery, packaging, bridge table covers, etc. The New York representative is Samuel Kaye.

United States Plywood Corp.'s Plankweld, strips of grooved birch plywood, which measure 8 ft. long by 16 in. wide and form a snug fitting wall interrupted only by the vertical lines denoting the lapped-over edges, has been used in one of the rooms of the "House of Years" being shown by W. & J. Sloane, Fifth Ave., New York City. Plankweld can be spot glued—requires no finishing—can be easily applied by householder.

E. I. du Pont de Nemours & Co., Inc.'s Plastics Bulletin for September gives attention to some of the company's latest plastics products. These include a nylon molded phonograph recording needle packed in an unusual dome-shaped acrylic package; an acrylic three-dimensional dial face for a radio cabinet; the highly popular polyethylene ice cube trays for refrigerators; the much-talked-about acrylic covering for oxygen tents; an unusual hand-brush with an acrylic back and nylon bristles which can be used for hand-scrubbing and nail-cleaning; and a nylon bristled flour dusting brush which can be used by bakers.

Bakelite Corp. has begun production of phenolic molding and general purpose materials in a new plant on a $3\frac{1}{2}$-acre site at Monterrey, N. L., Mexico. The plant will also serve as the Mexican sales agent for all Bakelite Corp.'s products made at Bound Brook, N. J. Norman Meyer is managing director; Bruce Duffett, technical superintendent, and Herbert Brach, sales manager.

Monsanto Chemical Co. announces the appointment of Dr. Reid G. Fordyce as sales development manager of their Plastics Div. and Edmund S. Childs as assistant manager of the Sales Development Dept. Dr. Fordyce has been with Monsanto since 1939 and replaces C. L. Jones, Jr., who recently was named sales manager for the Protective Coatings Dept. of Monsanto's Merrimac Div. John W. Stewart has been appointed to the New York sales and development staff of the Textile Chemicals Dept. and will be concerned with the introduction to the trade of the company's textile chemicals. Robert L. Rickenbacher replaces R. J. Lambert as the senior sales representative for Monsanto's Plastics Div. on the Pacific Coast. His headquarters will be at 605 W. Olympic Ave., Los Angeles.

The Girdler Corp., Louisville, Ky., is using a specially equipped station wagon to determine the amount of high frequency energy radiated by Thermex HF dielectric heating installations. The equipment is used to help individual molders solve their shielding problems to conform with the radiation minimum permitted by FCC.

Plaskon Div. of Libbey-Owens-Ford recently shipped almost 20,000 lb. of molding material by air from Toledo to Plastic & Die Cast Products Corp., Los Angeles, to be made into cosmetic boxes for Max Factor. This is supposed to be the largest plastics shipment ever made as air cargo and is claimed to be the largest single air freight cargo to leave Toledo. Ninety drums were in the shipment, which cost $1080 to haul.

Cox Plastics Corp., successor to Westcox Plastics Co., has installed equipment for processing vinyl film and sheeting into finished products using electronic sealing equipment, at its new location, 162 Colgate Ave., Buffalo, N. Y.

The company has added to its compression molding capacity and is producing such items as protective covers for equipment, chemical resistant linings for processing tanks, etc., on a custom basis.

United Wallpaper, Inc., Chicago 54, Ill., calls particular attention to its Varlar stainproof wall covering as one of the outstanding company developments of the past year. Its Annual Report is bound in Varlar wallpaper. United Wallpaper is also featuring ready-to-hang paper draperies which are synthetically treated.

Facil Fabrics Corp., 675 Fifth Ave., New York City, is supplying a vinyl coated paper and rayon laminate to be used for packaging, closet lining, fancy boxes, lamp shades, and window displays. The paper is laminated to unwoven rayon and then coated with vinyl chloride. After coating, the material is embossed to give quilted and other effects. The material is sold by Facil as yard goods only.

Franklin Jeffrey Corp., 1671 McDonald Ave., Brooklyn 30, N. Y., has added a Banbury mill to its equipment and plans to supply the trade with acetate and polystyrene molding material.

Holub Industries, Inc., Sycamore, Ill., is offering Sandscott Plastic Expanding Anchors which permit anchoring of screws in concrete, brick, plaster, and other building materials. The anchors are made slightly larger in diameter than the hole size to be drilled, and an expansion feature permits it to be driven into a tight hole, thereby getting holding power when the screw expands the anchor in any material. The manufacturer does not specify the particular plastic from which screws are made.

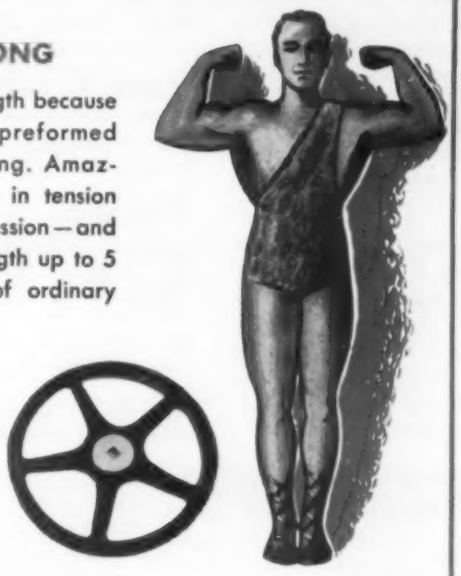
Celanese Plastics Corp.'s September bulletin calls particular attention to the use of cellulose acetate as a replacement

DESIGNERS

LET THE KYS-ITE *Extras* WORK FOR YOU...

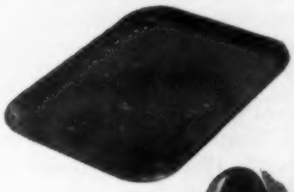
STRONG

EXTRA strength because KYS-ITE is preformed before curing. Amazingly strong in tension and compression—and impact strength up to 5 times that of ordinary plastics.



LIGHT

EXTRA lightness a specification? KYS-ITE rings the bell again. Here is the aspirin for a designer's headache: lightweight vs. strength. Get *both* with KYS-ITE.



BEAUTIFUL

EXTRA beauty yours with KYS-ITE. Endless opportunities for attractive color combinations—color is part of material itself. Stays beautiful—a wipe and it's bright!

DURABLE

Another EXTRA advantage. Unusually resistant to abrasion, cracking, chipping. Impervious to mild alkali and acid solutions, boiling water.

KYS-ITE

Reg. U.S. Pat. Off.

preformed plastic combining long-fibered wood pulp and synthetic resin

Here's an EXTRAordinary material.

Here's a *problem-solving* plastic that offers designers more—*far more*—than any other type of material. The versatile plastic for (1) large hollow pieces, (2) complicated pieces with projections or depressions, (3) large or small shapes with flat surfaces or thin wall sections.

We mold to specifications, deliver products complete, ready for use. Write us for full information.

KEYES FIBRE COMPANY
420 Lexington Avenue
New York 17, New York
Plant at Waterville, Maine

KEYES
MOLDED PRODUCTS

The Plastiscope

for cellulose nitrate in the covering of wooden shoe heels; shows how dealers can be aided in selling lamp shades; calls particular attention to the ethyl cellulose frame of the freeze chest compartment in a new Westinghouse refrigerator; and points out the advantages of Vimlite in place of tarpaulin weather shields in construction.

Thomas J. White Plastics Co. has recently moved into a new one-story, 21,000-sq.-ft. establishment at 7818 Weaver Ave., in St. Louis, Mo. The company will compound phenolic materials, engage in laminating and compression molding, and produce proprietary items. A new urea item called the Cream-a-Ret is a large pitcher with a trick spout for use in restaurants..

Sanford Lieber & Co. has moved to its new location at 525 W. 76th St., Chicago 20, Ill., and is specializing in extruded polyethylene monofilaments. Jack M. Schnitz is sales manager.

The Glenn L. Martin Co., Baltimore 3, Md., has added three members to its plastics and chemicals division on the sales and technical service staff. They are Willard de C. Crater, Eugene C. Hilkert, and Ira B. Wheeler, Jr.

Masland Duraleather's Duran upholstery was used to cover a good share of the furniture in one of the prize rooms shown by the Wieboldt Stores, Inc., in a two-month Chicagoland Home and Home Furnishings festival.

Worth-Green Displays, Inc., 200 W. 57th St., New York City, is a new company organized to supply a variety of point-of-sale displays and will specialize in laminated plaks. George Worth is president of the firm.

Morton-Gregory Co., Inc., has been newly organized to manufacture and sell new industrial and consumer products calling for large-scale use of Fiberglas yarns and other newly developed materials. The new products, also calling for the use of light metals and silicones, were developed for the organization by a group headed by Henry J. Morton, president of H. J. Morton Associates, Inc., Detroit.

Mr. George E. Gregory, vice-president of Owens-Corning Fiberglas Corp. of Toledo 1, Ohio, has resigned to head the new company.

Induction Heating Corp., manufacturers of Ther-Monic induction and dielectric heating equipment, has moved to new quarters at 181 Wythe Ave., Brooklyn 11, N. Y.

Howard Ketcham, Inc., industrial design and color engineers, New York City, has been retained as consultant by Nissley of Colorado, Inc., Colorado Springs, Colo., on product design and package development. A plastic air-hose attachment which permits checking of spare tires without opening car trunk compartments, and a line of plastic products for home and personal use, are being developed.

Greentree Products, Inc., 1140 Broadway, New York City, has announced production of 105-gage vinyl floor tile. Designed particularly for installation in public buildings, it is sold by the retail trade for around 90 cents a sq. foot. It is about $^1/_8$ in. thick without backing, although a layer of felt is recommended.

PERSONAL

Delbert Brannon has disposed of his interest in Summit Molded Products, Inc., Summit, N. J., to Alladin Plastics, Inc., of Los Angeles. Mr. Brannon has joined the Kellex Co., who helped engineer the atomic bomb projects, as assistant service manager. Summit Molded Products, molders of polystyrene dishware, egg packs, and other items, has been closely associated with Alladin Plastics since the company's formation.

Joseph W. Parks is manager of the newly combined Closure and Plastics Sales Div. of Owens-Illinois Glass Co. Leonard Phillips, former manager of the Closure Sales Div., is now Eastern district manager for both divisions.

Ernesto Del Valle of Mexico has been retained by B. F. Goodrich Chemical Co., Cleveland, as exclusive sales agent in the Republic of Mexico for all the company's products. Del Valle will handle the sale in Mexico of Geon polyvinyl resins and plastics, Hycar rubber, Kriston thermosetting resins, and the company's entire line of Good-rite rubber and organic chemicals.

John H. Thomas has been named vice-president and purchasing director of Owens-Corning Fiberglas Corp., succeeding George E. Gregory. Ben S. Wright will become general sales manager.

Julius Weinstein has been appointed manager of the New York buying office of Max Factor & Co., 730 Fifth Ave., New York City, manufacturers of cosmetics and large users of plastics for compacts, etc.

Ernest R. Hanson has joined the staff of Foster D. Snell, Inc., New York City, to head up research and development in the field of plastics and rubber. Mr. Hanson was formerly connected with the Halowax Corp. and the Bakelite Corp.

Fred K. Shankweiler, formerly manager of Hercules Powder Co.'s Cellulose Products Dept. in Chicago, has been named manager of the department's office in New York City, succeeding L. C. Kleinhans. Clarence W. Gault replaces Mr. Shankweiler in Chicago.

Stuart O. Fiedler, of Bjorksten Research Laboratories, has resigned as manager of the South Chicago branch to become manager of research of the Industrial Rayon Corp., Cleveland, Ohio. He will continue on the Board of Directors of Bjorksten Laboratories.

Dr. Charles F. Winans, chemical director of the Pennsylvania Coal Products Dept. of Koppers Co., Inc., since last January, has been named plant manager.

Owen J. Brown, Jr., general sales manager of Godfrey L. Cabot, Inc., has been elected a vice-president of the firm.

Harry Schaeffer, who served as a plastics consultant in the Quartermaster General's office during the war, has joined Cambridge Molded Plastics Co., Cambridge, Ohio, as a sales engineer.

Henry Stauffer, associated with the Rohm & Haas Co. for 16 years, has joined the Steiner Mfg. Co., 47–30 33rd St., Long Island City, N. Y.

Walter Enoch, has joined Lustra-Cite Industries, Inc., 225 W. 28th St., New York City, manufacturers of plastic displayers under the trade mark Lico Creations. Lustra-Cite has announced a new 20-page catalog featuring 150 stock displays for every type of business.

Deceased

J. Stogdell Stokes, 77, Sept. 27, president Stokes & Smith Co. and Durite Plastics, Inc., and vice-president Yarnall-Warning Co., all of Philadelphia.

Vernon E. Royle, Sept. 19, retired president John Royle & Sons, Paterson, N. J.

MEETINGS

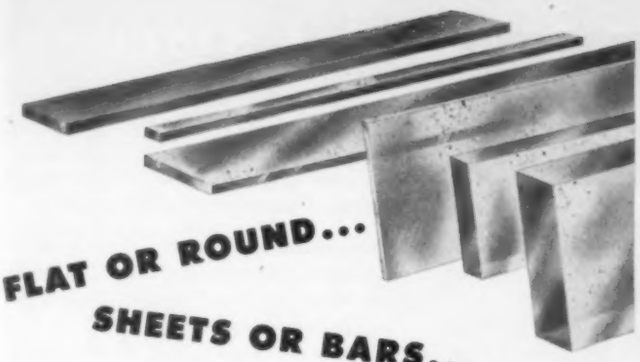
November 18–19—Packaging Institute meeting, New York City.

December 1–6—Chemical Industries Exposition, New York City.

December 3—American Society of Mechanical Engineers, Atlantic City N. J.

December 4–6—Society for Experimental Stress Analysis, New York City.

(*Please turn to next page*)



FLAT OR ROUND...

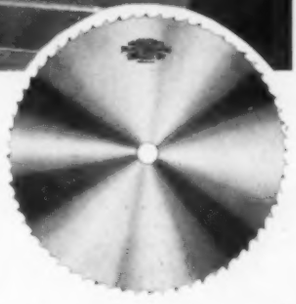
SHEETS OR BARS...

CUT THEM WITH

ATKINS

"Silver Steel"

CIRCULAR SAWS



Save both time and money, as many leading plastic users are doing, by using Atkins "Silver Steel" Circular Saws. These precision-built saws have proved themselves superior on every count . . . cleaner, cooler, longer cutting . . . speed, smoothness, economy.

Also, you have less finishing to do on plastics cut with Atkins Silver Steel saws. Cuts are uniformly smoother. And the famous "Silver Steel" gives the teeth an extra sharpness that lasts to give you longer cutting periods. Change to Atkins "Silver Steel" Saws . . . they give you greater speed and feed . . . push up production, lower costs.

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The Plastiscope

January 21–23—Society of Plastics Engineers National Conference at Horace H. Rackham Educational Memorial, Detroit, Mich.

February 16–17—S.P.I. of Canada at Mt. Royal Hotel, Montreal.

S.P.I. MEETINGS

Fall meeting, Midwest Chapter

Approximately 85 members of the Society of the Plastics Industry assembled at the French Lick Springs Hotel, French Lick, Indiana, for the Fall meeting of the Midwest Chapter last October. Norman Anderson, chairman of the Chapter, W. K. Woodruff, vice-chairman, and Ralph E. Blanchard, secretary-treasurer, presided over the various meetings.

Group mergers—George H. Clark, of the Formica Insulation Co., and president of S.P.I., informed members at the dinner meeting that he hoped for a satisfactory conclusion of current negotiations with the Society of Plastics Engineers whereby a unification of the two organizations would come about, and pointed out the need for cooperation.

Sales responsibility—A. Kip Livingston of DuPage Plastics Co. started off the general theme of "sales responsibility" to the plastics industry at the opening session when he declared that the time has come for product design to be based on special properties of plastics materials instead of being a mere duplication of previous designs in other materials.

Mr. Livingston listed plastics products which in his opinion had failed to deliver satisfactory service and pointed out that when the consumer learns to know the limitations of plastics, there will be less uncertainty regarding their purchase. He asked that the industry unite to create a common symbol to identify acceptable articles with a "tested plastic" seal which would build consumer confidence. He urged that the seal be issued by an independent laboratory retained by the industry to test products for consumer service. As a final step in the program, he urged that plastic products carry labels which would detail their limitations as well as their virtues and tell how to handle, repair, and store them.

Such a plan, Mr. Livingston suggested, could be financially supported by an appropriation of $100 from each of S.P.I.'s 600 member companies.

Labor law—Benjamin Werne, a labor counsel who talked to the members about the Taft-Hartley labor act, told his audience that unless management takes steps to acquaint itself more fully with the law, it is doubtful that the law will remain on the books much longer.

The S.P.I. is soon to issue a new booklet of about 40 sections based on an analysis of several labor contracts in actual use by plastics companies. Indexed for easy reference, the booklet will rate actual clauses for their legal value and indicate what points should be covered by various types of clauses in labor contracts. It will be made available to qualified firms as a working tool.

Polystyrene treatment—An interesting addition to this first morning's session were the remarks of Dr. Johan Bjorksten, president of Bjorksten Research Laboratories, Chicago, who described a new surface treatment for polystyrene with a material called "Logoquant," which, he said, increases scratch resistance of the surface by 18 percent, improves light transmission properties by 14 percent, and eliminates electrostatic attraction. This material is described on page 162 in this issue of MODERN PLASTICS.

Design and sales—At the Friday meeting, emphasis on design and sales was again urged, with Carl Sundberg pointing out that plastic product design must take the woman of the family into account because she is "style conscious." He suggested that even heavy-duty factory equipment, garden tools, and other utilitarian items sell better when smartly designed, and pointed to products such as curved watches, pop-up toasters, and vacuum cleaners with head lights, as illustrating the utility of dramatic effect in design.

Cost of selling—Clyde O. Bedell, an advertising counsel, called particular attention to the importance of sales expense in mechandising and cautioned his listeners that sales expense is low today because of high volume and little competition. Profit rates are also low on a percentage basis. Any one of these trends, if continued in a more intense competitive period, will endanger profit. When selling costs go back up to normal, he says that they will have to be held in control by improving the machinery of selling and by improving salesmanship itself.

New England meeting

At the New England Section meeting of S.P.I. at Manchester, Vt., a similar pattern to the Midwest Chapter meeting was followed. Horace Gooch of Worcester Moulded Plastics was in charge of meeting arrangements.

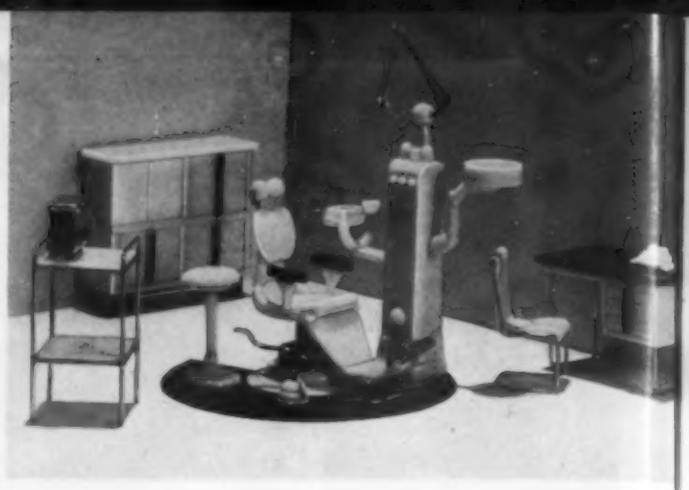
The featured speaker at the dinner meeting was Governor Ernest W. Gibson of Vermont. Messrs. Werne and Sundberg talked along lines similar to those at the Midwest Chapter; F. W. McIntyre, Sr., of Reed-Prentice Corp. and chairman of the S.P.I. machinery division, held a special meeting of machinery representatives.

Informing customers—D. S. McKenzie, general sales manager, Chemical Dept., General Electric Co., Pittsfield, Mass., gave his opinions on the sales responsibilities of the plastics industry. He thinks the industry began to lose sight of its responsibilities when the extraordinary accomplishments of the industry were picked up by the press and some of the more promotionally minded members of the industry and were "projected into the great blue yonder to a post-war world where everything short of the digestive and procreative functions of the human race would be done by plastics." He pinned a large part of the blame for this situation on raw materials manufacturers, editors, and reporters who, he thinks, became too enthusiastic about some new things that are coming along.

Mr. McKenzie thinks that the way to correct this situation is to immediately start informing the customers about plastics so that they can distinguish one from another; then they will know better than to put a thermoplastic grater under a Thanksgiving turkey to hold it up off the pan, or to dip fried potatoes out of hot grease with a thermoplastic spoon.

The industry should be cognizant of the needs of its customers, Mr. McKenzie said, and should never take the position that the public is "ripe for picking." The philosophy that each new customer is the beginning of a long and mutually profitable relationship should be paramount in the industry's public relations; there is no real opportunity in this business for the "One Shot Sales Policy."

Educational program—J. T. Chirurg, president of the James Thomas Chirurg Co., advertising agency, told the members that a broad, market-widening educational program for plastics is the sole responsibility of the S.P.I. Individual members cannot do the job—it must be done by the industry as a united body. He pointed out how industries such as gas, light and power, copper and brass, and others, were now spending in excess of $20,000,000 a year in association programs to keep their products before the public. Then he remonstrated with the plastics industry for its appalling public relations appropriation of $5000 a year. A sound public relations program, said Mr. Chirurg, involves more than just advertising to designers and production men; it should also be aimed at the top executive group where company policy controls changes from traditional materials to plastics. The program must be continuous and should be broad enough to enlist the support of retail stores which carry plastics products.



These attractive miniatures can be arranged by salesman to show dentist just how his offices can be renovated

Plastics sell dental equipment

EVERY salesman knows that it is easier to sell an item when the customer can be shown a sample. But samples of large items cannot be taken to a customer and it is not always possible to take the customer to the sample. One solution to this problem is being tried by an English dental equipment manufacturer in the form of plastic models of its products. This firm, Cottrell & Co., of London, showed fabricated acrylic models of its dentists' chair, sterilizer, cabinets and desk at a recent exhibition of the British Dental Association.

Useful as premiums or toys

Originally, Cottrell had these accurate scale models made for its travelling salesmen to carry as samples. But so much interest was aroused by the models that the company soon got the idea of using them as premiums. Now it is thought that they may also find a market as toys—especially to amuse children in dentists' waiting rooms. They are in scale with normal doll furniture.

Some parts to be molded

The prototype samples were fabricated by the Solsway Plastic Laboratories of London. Now, this firm has tooled up for quantity production and some of the parts will be injection molded. Other parts will still be fabricated from $^1/_{16}$, $^1/_8$ and $^1/_4$-in. Perspex sheets. Perspex cement No. 6 and ethylene dichloride solvent are used in the fabrication.

The sterilizer, the cabinet and the footplate of the chair are made of chromium-plated acrylic. Stainless steel is used for levers, engine cable, movable headrest parts, and furniture frames.

Two new ink sets

A SPILLPROOF desk set of cellulose acetate butyrate and a phenolic set featuring two ink wells are interesting examples of the adaptability of plastics materials.

Dual set of phenolic

The Dual Swivodex, latest model in the line of desk accessories of the Zephyr American Corp., New York, N. Y., features a black-top well for black ink, a red-top well for red ink, and compartment for paper clips.

The base, paper clip compartment cover and several other parts are molded of Durez by Plastics Div., K & C Experimental Works, 106 Straight St., Paterson, N. J. Molded-in cavities for the ink wells are rounded and allow the wells to pivot and revolve. The glossy black finish is permanent and stainproof.

PHOTO, COURTESY DUREZ PLASTICS & CHEMICALS, INC.

Pivotable wells for red and black ink, and center compartment for clips are features of this phenolic set

A safety set

Almost two years were spent in the design and making of the molds for the Spil-Pruf desk set, a product of Hamilton-King Co., Eagle Rock, Calif. Tenite II was selected after extensive tests showed it to be suitably tough and acidproof for the job.

There are 12 parts to this set: two feeds, two ribs and one shank for the pen, body piece, two bottoms (one of transparent cellulose acetate butyrate), fountain entrance, cap, drawer and white spillproof unit for the inkwell. These parts are injection molded by Southern California Plastic Co., 1805 Flaven St., Glendale, Calif., in dies which vary in size from 3 to 16 cavities. The capacity of these dies is 150,000 a month.

(*Please turn to page 196*)

PHOTO, COURTESY DUREZ PLASTICS & CHEMICALS, INC.

Phenolic parts of set include main base; well base, top and feed; compartment lid; pen staff, point holder

The assembling of these units is handled by Hamilton-King Co. Body, spillproof unit, fountain entrance and two bottoms are cemented together and, with screw cap and drawer, form the ink well. The pen feed and rib are assembled together with a stainless steel point for medium writing. An extra nib for fine line work is placed in the drawer where it is immediately accessible. This drawer can also be used for holding paper clips, stamps or additional pen points.

The reservoir will not spill or allow ink to escape if accidentally pushed on its side or knocked to the floor. It permits a tidal action that keeps the pen point constantly bathed with ink, eliminating frequent dipping. The design also prevents souring action caused by stagnation.

The set is available in blue, green, maroon, black, red and mahogany.

A drawer for pen points or clips is incorporated in this spillproof set of cellulose acetate butyrate

More products in plastics

(*Continued from page 84*) while in operation, as well as alcohol solutions used for cleaning.

The vaporizer operates for more than one hour without refilling and will automatically shut off when the water has evaporated from the instrument. This safety feature enables the patient to sleep while the vaporizer is in operation. A molded cup in the cover holds cotton which is saturated with the medication. The steam circulates within the inner shell, absorbs the medication and passes out through a small opening in the cover, producing a perfect medicated vapor without losing any of the medicinal properties of the prescribed formula. As the medication does not come in contact with the water or electrodes, the vaporizer is easy to keep clean. Air space between the water container and the outer shell forms an insulation that keeps the vaporizer from becoming too hot to handle.

The Continental Can Co., Inc., Cambridge, Ohio, molds the container and Peerless Molded Plastics, Inc., Toledo, Ohio, molds the cover.

Sundberg-Ferar offer as a projection for the immediate future an electronically low-pressure molded plywood chair with foam rubber seat and inside arms, covered with woven Saran vinylidene chloride monofilaments or some other synthetic webbing. Mass production, they state, would bring costs of a quality chair in reach of a host of buyers who now cannot afford such luxury.

Coffee scoop reaches down

Another designer who has made a special study of plastics (he has a laboratory devoted entirely to the subject) is Egmont Arens. As an example of his recent design work in plastics he offers the Silex coffee scoop, injection molded from polystyrene by the Auburn Button Works, Inc., Auburn, N. Y., for the Silex Co. The old and new designs illustrate the advantage of the long handle and bowl shape to reach down into a coffee bag or deep can.

Cigarette box . . . refrigerator

Robert Fondiller recently designed an ivory-colored polystyrene Christmas gift container for Philip Morris & Co., Ltd. The box contains four "flat fifties" and 10 packs of cigarettes, and had to be designed with considerations of dignity, re-use value, speed of production, and economy. Polystyrene was specified because of dimensional stability, color-matching capacity, specific gravity, and molding cycle. The huge order was split up among Lustron, Styron, and Bakelite polystyrene. Molding is done by Waterbury Companies, Inc., on a 22-oz. machine. The molding company uses a sand-blast finish in the mold to provide a matte finish on the box; it also uses a special antique rub-in to give depth to the bas-relief motifs.

(*Please turn to next page*)

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Here's an interesting example of cooperation between designer and molder in the interests of a mutual client: Fondiller used a hinge patented by Waterbury Companies, Inc. — a simple, easy-to-mold, strong hinge that eliminates the need for metal inserts.

In Fondiller's projected refrigerator the conventional door is replaced by plastic drawers, all equal in size and made in the same mold. They are planned to be made in inner and outer sections with dead air space between for insulation. The front of each of the drawers is coated with a one-way mirror surface, providing privacy for the contents when the light is off but exposing them when it is switched on by foot pedals. Pedals open drawers separately. A work tray at counter height can be pulled out and even removed completely for use in serving. Since a top drawer would be out of convenient reach for the average woman, the top compartment has polystyrene doors similarly treated. Top surface is flat, with a rim, for temporary storage not possible with a domed refrigerator.

Shoe polish dispenser

A shoe polish applicator-package is the projection of another new design house, Rawald-Woolley-Tanuma. It would use paste polish and would be quick, easy, and clean to use. A twist of the cylinder forces polish into the polystyrene bristles and the applicator is then ready for use. A snap-on cover (made with a small undercut) would keep the brush clean and prevent polish from hardening and clogging when not in use. Reloads in the shape of a cylinder could be inserted from the back.

Clients stick to plastics

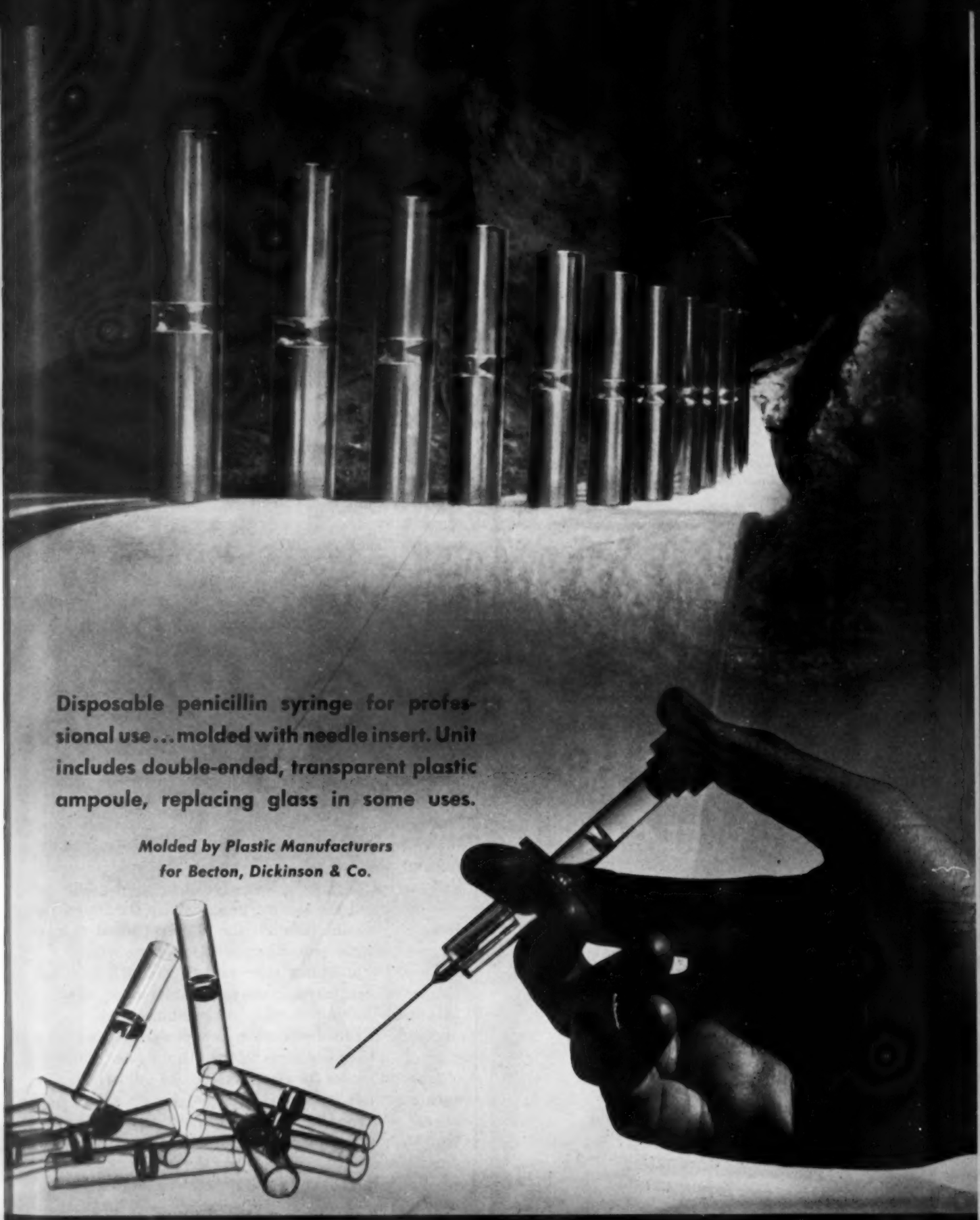
Several designers report that some clients who switched to plastics because of shortages of other materials have a reactionary tendency to abandon plastics in newly designed products. But designers are showing these clients the wisdom of sticking to plastics where plastics have proved satisfactory.

This point adds emphasis to the above detailed picture of what designers are now doing and hope to do with plastics. The only fear they express is that a condition of oversupply might lead to high pressure selling and to misuse of otherwise excellent materials.

Certainly the industrial designer is one of the best friends of plastics—and of the buying public!

Sorry!

The article, "Color marking process," on page 184 of the October MODERN PLASTICS failed to mention that the Harvel watch box and the Westmore make-up box pictured were molded by Plastic Molded Arts, Inc., 12-04 44th St., Long Island City, N. Y. The cigarette box in the same picture was molded by Tech-Art Plastics, 35-42 42nd St., Long Island City, N. Y.



Disposable penicillin syringe for professional use... molded with needle insert. Unit includes double-ended, transparent plastic ampoule, replacing glass in some uses.

Molded by Plastic Manufacturers for Becton, Dickinson & Co.

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Monomers

(*Continued from page 89*) saturated, as would be the case with ethane (C_2H_6). When double or triple bonding is indicated, the compounds are unsaturated, as for ethylene (C_2H_4) and acetylene (C_2H_2). The benzene ring is an unsaturated compound with double bonds alternated with single bonds.

Reaction in side chains

In most high-polymer structures, the straight chain carbon-to-carbon bonding forms the base of the structure and the reactive portions of the molecules are found in side chains which branch from it. The important polymers, cellulose and cellulose derivatives, and the phenolics, have rings as major part of backbone.

The synthetic plastics, fibers, and rubbers being organic high polymers, as well as the silicones which are primarily inorganic, can be differentiated if the molecular chains are arranged and extended along the same axis by extrusion or milling on rolls, and then stretched. The rubbers generally will snap back to the original position upon release of the stretching force, while the plastics will return more slowly. This slow return is due to the side chains, and many times the fibers remain in the stretched position and as such will show a marked increase in tensile strength.

Structure determines strength, stretch

The structure of the side chains accounts for this difference in character. If the side chains are large and bulky and contain groups which exert only feeble attraction for groups on other chains, the chains cannot pack closely nor can they be held in a stable orientation when drawn by stretching, so the material snaps back to its original position. If the side-chain groups are small and exert strong attractive forces, the material remains stretched, and the locking produced by the forces on these side chains between the closely packed chains increases resistance to slippage and rupture.

Thus, by providing side chains with high bonding forces, we can increase strength and reduce stretch. Likewise, the introduction of substances which are attracted and held separately between the chain molecules would tend to weaken the attraction of the side chains and render the plastics more like rubber. When such materials are added they are known as "plasticizers" and have the function of rendering the plastics more soft and fluid when heated and more soft and flexible when cold. Thus, when the polymer chains are free and not interconnected, the material is fusible with heat and soluble in proper solvents. The material in this state is known as "thermoplastic."

As bonds are formed between the polymer chains, the material becomes less readily softened by heat and more difficult to dissolve. A degree can be reached in the cross-linkage where the material is practically infusible and insoluble. Such materials are known as "thermo-

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setting." It is interesting to note that heat speeds the reaction of cross-linkage but does not cause it.

Cotton and wood fibers

Consideration of the cellulose derivatives such as cotton and wood fiber is interesting to illustrate the change from a practically infusible and insoluble material to one which is permanently fusible and soluble. The cellulose unit chain has small side chains permitting close packing. The reactive groups (OH) exert strong attraction between the chains.

When cellulose is treated with a strong acid under proper conditions and with strong sulfuric acid present as a catalyst, the strong acid replaces the (OH) groups with the acid group, thus forming a salt, called an "ester." If this acid is HNO_3, cellulose nitrate results; if acetic acid is used, cellulose acetate results; if a mixture of acetic and butyric acids is used, cellulose acetate butyrate results. All of these are plastics, and all of them are permanently fusible and soluble, in marked contrast to cellulose.

Another interesting interchange is indicated by the degree of nitration. When a cellulose nitrate contains 13 percent N, we have guncotton; when it contains only 12 percent N, we have a lacquer base material; and when the percentage is reduced to 11 percent we have a base for plastics. When camphor is used as a plasticizer we get such well-known plastic materials as Celluloid, Pyralin, and Nixonoid.

These plastics are all easily dissolved or re-dissolved in organic solvents, except hydrocarbons, and have a medium water absorption. They tend to discolor and decompose when exposed for long periods to direct sunlight. The plasticizer is volatile, so in time the material becomes brittle.

Vinyl group

In the vinyl group, the mechanics of polymerization is the release of one of the double bonds giving each carbon a free bond to use linearly. This is by no means a simple reaction and requires very careful control of temperatures and careful consideration of the catalyst. When the third element in this monomer is chlorine (Cl) we have the vinyl chloride base for polyvinyl chloride and polyvinyl chloride acetate. When acetylene gas combines with hydrogen chloride, vinyl chloride is produced; when acetylene combines with acetic acid under the proper conditions the product is vinyl acetate. These monomers are polymerized to produce polyvinyl chloride or polyvinyl acetate. The latter possesses exceptional adhesive qualities and is readily soluble in a wide range of organic solvents. It thus becomes a good surface coating and cement. Polyvinyl chloride, although thermoplastic, is difficult to mold and is soluble only in high boiling point solvents.

When vinyl chloride and vinyl acetate form a copolymer we get a material which forms a good plastic and good coatings. It varies from a soft, rubber-like consistency to a rigid material suitable for electrical transcription records. It is often extruded around wire

and gives excellent electrical insulation. It is permanently flexible, resistant to water, chemicals, and ozone, and is nonflammable, due to presence of the chlorine ion.

When the polyvinyl acetate is treated with a strong water solution of caustic soda, under proper conditions, it is converted to polyvinyl alcohol, which is water soluble, and is the basis for many of our paper coatings and cold-water paints. Polyvinyl alcohol in turn may react with an aldehyde to form a polyacetal, the most important one of which is polyvinyl butyral. Since there are large bulky groups introduced into the side chains of the polymers, we may expect rubber-like properties. The material is too soft and rubbery for plastics, but it is tough, water resistant, and permanent. It is excellent material for waterproofing textiles and for the plastic sheet of safety glass. Thus, it has been used to produce "rubberized" fabric.

A modified polyvinyl butyral, which cross-links partially when carefully heat treated and so does not soften upon reheating, is frequently used in safety glass. The bond of this material and its strength are indicated by the fact that a $^1/_2$-in. sheet of polyvinyl butyral with a $^1/_8$-in. thick plate glass on either side can resist the impact of a 15-lb bird carcass when encountered by a plane traveling at 300 miles per hour. The material is more permanently stable to sunlight and ozone than rubber, is tough, flexible, optically clear, transparent.

Vinylidene chloride is a monomer which can be used to form polyvinylidene chloride which is permanently fusible and soluble. It is very resistant to solvent action and is so difficult to control in fusion that it has not been found to be practical. When proportioned with vinyl chloride, forming a co-polymer, and with other monomers for the purpose of controlling the action of the polymer, practical properties of value are obtained.

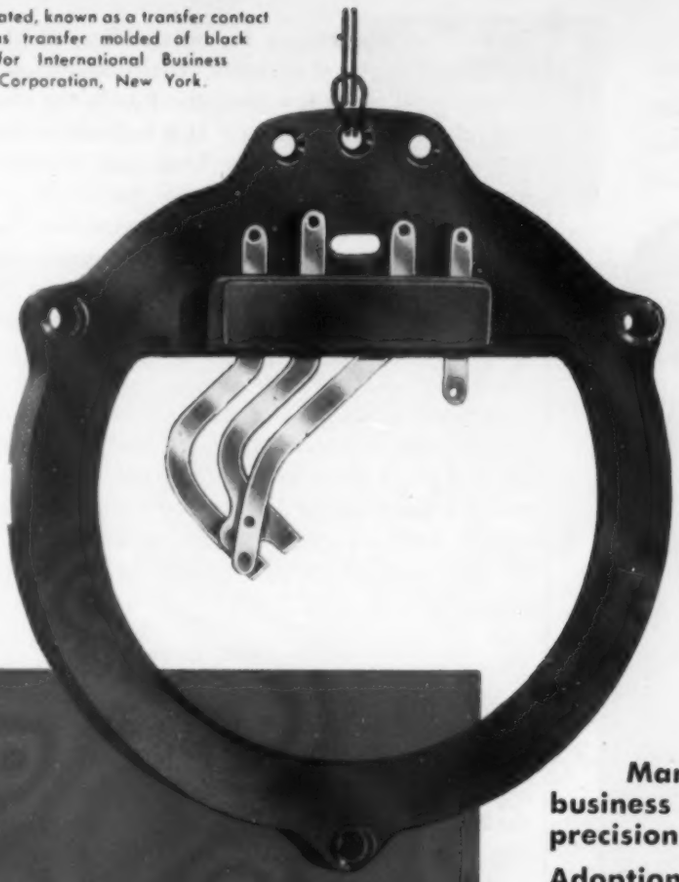
The vinylidene chloride and vinyl chloride co-polymer is thermoplastic and can be molded in injection presses. It has been extruded as tubes up to 6 in. in diameter. As a fiber it has high tensile strength, good flexibility, and permanence, but practically no stretch. This material is impermeable to water and water vapor, has excellent chemical resistance, and is resistant to acids either strong or weak. Only one alkali—ammonia—affects it. It is resistant to almost all common organic solvents and has a softening temperature of 240° F.

Characteristics of polystyrene

The ethylene monomer is based on petroleum and reacts with hydrogen chloride to form ethyl chloride. When ethyl chloride reacts with benzene it produces ethylbenzene. The chemical decomposition of ethylbenzene by heat produces vinylbenzene, which is commonly called styrene. When this monomer is combined to form a polymer it forms polystyrene.

This polymer is permanently fusible and soluble. It is transparent but turns yellow under the influence of light and possesses a high refractive index. It has excellent resistance to water, acids, and alkalies, and has a low water absorption of only 0.04 percent in 24 hr. of

Part illustrated, known as a transfer contact holder was transfer molded of black phenolic for International Business Machines Corporation, New York.



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immersion. Presenting an outstanding resistance to the flow of electrical currents, particularly those of high frequency, it has a low dielectric loss factor almost the equivalent of fused quartz. It is inclined to be brittle, but when plasticizers have been used to relieve this situation many of the desirable electrical properties have been destroyed. Being a hydrocarbon it is naturally flammable and it has a softening point below the boiling point of water.

To correct some of these objections two chlorine atoms are substituted for two of the hydrogen atoms in the benzene ring. As a monomer it is called dichlorostyrene; as a polymer, polydichlorostyrene. When so treated, this polymer produces a material that is nonflammable, slightly less brittle, and with a softening point of about 250° F. Its water absorption is reduced slightly and is very good. Its resistance to acids and alkalies is excellent and its high-frequency insulation properties are good.

Acrylic group

An interesting transition of the monomer ethylene produces a succession of subordinate monomers, namely, acrylic acid, methacrylic acid, and methyl methacrylate. If one of the hydrogens in ethylene is replaced by the organic acid group (COOH), acrylic acid is formed. If a second hydrogen is replaced by the methyl group (CH_3), methacrylic acid is formed. The methyl salt, or ester, of methacrylic acid is methyl methacrylate, the monomer of an interesting polymer, namely, poly (methyl methacrylate). This is the material which is commonly known by the name of Lucite or Plexiglas.

Aldehyde condensation products

A brief consideration of the aldehyde condensation products is desirable. To produce these products the first step is to manufacture a heat-fusible resin suitable for molding; the second step is to convert this resin into an infusible material. The first stage consists of forming a linear polymer by the condensation reaction of an aldehyde with some other material. The second stage consists of the formation of cross-links between the chains by further aldehyde condensation reactions using catalysts. One of the principal aldehyde plastics is made with urea, which is produced from CO_2 and NH_3. Formaldehyde is produced from the methane in natural gas. The reactive parts of the urea molecule are the two amino groups, while in the formaldehyde, the oxygen is the reactive portion.

Other monomers

Besides the monomers discussed we may list melamine and phenol which are used extensively to produce valuable formaldehyde products. The simplest phenol monomer, which is the base of the "phenolics," is pure carbolic acid. When this monomer reacts with formaldehyde, and the condensation product is catalyzed with an alkali or a small amount of acid, a product soluble in alcohol is produced. This is used for impregnating papers or fabrics to produce laminating adhesives.

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The "equivalent circuit" was pioneered by Bell Telephone Laboratories 25 years ago. It is a useful tool in many Laboratories developments—saving time, saving the cost of machine-tooled models, encouraging experimentation. It is one more example of the way Bell scientists get down to fundamentals as telephone progress continues—and service keeps on improving for all subscribers.

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Polystyrene in Germany

(*Continued from page 133*) with the polymer; for other colors the weighed dye is added directly to the polymer on the rolls to prevent contamination. Rolling time varies from 12 to 20 min. depending on speed of dispersion of the dye. When Polystyrol EF is being rolled, it is essential that the charge be added in the center of the rolls, otherwise such pressures may develop as to result in fracture of rolls at neck. Styrene monomer is evolved during rolling of this polymer.

In all cases the material is removed from the rolls in sheet form, folded once lengthwise, and allowed to cool. It is then broken by passing through a pair of horizontal rolls of coarse star profile which loosely intermesh, guarded to avoid injury to operators by flying pieces of the brittle resin. This produces fragments 1 to 2 sq. in. in size and $^1/_4$ in. thick, practically free from dust. Output is 3000 to 3800 kg. per three men per 8 hours. The product is ground finally in M.A.G. or Excelsior mills.

The M.A.G. mill consists of a rotating grinding disk studded with 12 to 30 pins which moves between a series of fixed pins. The diameter of the rotating disk is 780 mm. and it operates at 2250 r.p.m. Output is 900 to 1100 kg. per two men per 8 hours. The product of this grinder contains fines which are fed back to the mixing mill.

The Excelsior mill is also essentially of the pin type, but in this case the intermeshing pins or studs are arranged in triangular groups on the two fixed and one rotating grinding plates, the number of pins decreasing toward the center of the plates. Each pin is of lozenge plan with a sharp edge running in a direction parallel to the direction of rotation. The pins on the rotating plate run in the circumferential spaces between the fixed pins. The distance between fixed and rotating plates is adjustable and determines the granular size without the use of a screen. The diameter of the rotating plate is 600 mm. and the speed is 500 to 600 r.p.m. Output is 750 to 900 kg. per two men per 8 hours. The product is relatively free of fines.

After grinding, the material is sieved on a vibrating screen operated by a small motor driving a vertical shaft to which an eccentric is fitted. Finally the granules are passed over a magnetic separator to remove any iron which might have been introduced during grinding.

Ten standard colors were made, including 30 to 40 tons per month of black and 25 to 30 tons per month of white Trolitul III. The polymer for this type was purchased from Ludwigshafen at 2.50 RM/kg. and sold at 3.50 RM/kg. Coloring costs were reported to average 0.6 RM/kg, of which 0.13 RM/kg. was for processing.

A filled grade of polystyrene was made using one part of ground quartz (6.85 RM/100 kg.) to four parts of Polystyrol III by weight. The output was 500 to 1000 kg. per month with a processing cost of 0.15

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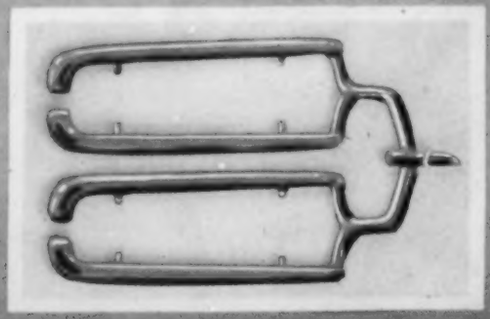

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RM/kg. Its electrical properties are not so good as those of unfilled polystyrene, and the quartz filler abrades the mixing rolls and molding dies. Its advantages are higher softening point and lower cost.

Experimental compounding process

To reduce the cost of coloring, extrusion mixing with single and double extruders was investigated. The single extruder had a screw 240 mm. in diameter and 1070 mm. long. This machine did not produce a satisfactorily mixed material.

Properties and applications

The compositions, 1942 tonnage, and cost and selling prices per kg. of the various polymers made with styrene in Ludwigshafen are shown in Table I (page 133).

The double extruder had screws 30 mm. in diameter and 500 mm. long, operating at 30 r.p.m. with screw centerlines 20 mm. apart. The screws were constructed as follows: three coarse threads, each 25 mm. in width; a 25-mm. open space; four semi-coarse threads, each 15 mm. in width; a 25-mm. open space; 20 threads, each 15 mm. in width. Both screws have an outside bearing at the extruder head and rotate in the same direction. This extruder was operated successfully for 600 hr. to mix colored polyamide molding compounds at the rate of 3000 kg. per month.

Even if extrusion coloring will result in lower costs than mill mix coloring, it still requires heating of the polystyrene to soften it for incorporation of the color. This undesirable heating operation with attendant depolymerization cannot be eliminated conveniently for small-volume colors. But for large-volume standard colors, coloring in the polymerization process is contemplated, particularly for black and white which have a sufficiently large volume to warrant the operation of one tower unit (output 25 tons per month) continuously on one color. This is important from the standpoint of cost as well as of quality.[4]

Approximately 4500 tons of Trolitul molding powder were made in 1944. Properties of various types of Trolitul are shown in Table II (page 133). Polystyrol III (m.p. 65 to 70° C.) is the principal grade used for injection molding of electrical insulating parts, containers, combs, and the like. Polystyrol IV (m.p. 70 to 75° C.) is slightly more heat- and shock-resistant than III. Polystyrol EF (m.p. 70° C.) has also been used for injection molding, particularly for fuse parts during the war, and has some application as an emulsion for sizing paper. Polystyrols EN (m.p. 80 to 85° C.) and EH (m.p. 90 to 95° C.) are used for making printing type because of low shrinkage, abrasion resistance and solvent resistance. The EH copolymer is also used for laboratory apparatus because of its resistance to boiling water. Polystyrols B and L are used in lacquers. B is more flexible and soluble in common lacquer solvents. Its low viscosity makes it easier to apply as a coating and to produce a smooth film. (*Please turn to next page*)

[4] Cost for mill mixing of colored polystyrene in the United States is reported in reference [6] to be 5 to 7 cents per pound.

Another application of polystyrene in Germany is its use for the manufacture of foil for electrical insulation. This is made by the Norddeutsche Seekabelwerke A. -G., Nordenham-Bremen, on a specially developed machine. The polystyrene is extruded as a tube of 1 to 2 mm. wall thickness and drawn over roller bearings on a conical form to stretch and orient the film in two directions. The thickness is reduced to 0.01 to 0.02 mm. The foil is called Styroflex.

The following list summarizes the many fields of application of polystyrene in Germany:

Telephone installation equipment—Parts especially for interior use, such as relays, insulation parts for low-current installations, earphones.

Radio industry—Tube sockets, spools, miscellaneous insulation parts.

Electrical industry—Spool bodies, resistance cores, switch parts, disk counters, antenna buttons, coaxial cable insulation, insulating foils and tapes, insulation for high frequency, tool handles, battery boxes and separators, plugs, cases for pocket flashlights.

Cosmetics—Compacts, lipstick cases, closures for tubes and other containers.

Medical and pharmaceutical industries—Bottles with eye droppers, other bottle-like containers, boxes for tablets and pills, inhalers.

Articles for smokers—Cigar and cigarette holders, nicotine absorbing parts, accessory containers.

Household and other equipment—Teething rings, safety razors, pencil sharpeners, salad sets, spoons, liquor pourers and glasses, suspender parts, thimbles, handles for toothbrushes and umbrellas, containers for matches, salt shakers.

Furniture parts—Door knobs and handles, drawer pulls, key labels, furniture ornaments.

Costume jewelry—Necklaces, bracelets, pins and brooches, badges, decorations for hats and hand bags, hair ornaments, rings, small toys.

Packaging—Compacts, boxes for pills, closures for tubes and other containers; tube shoulders; bottles for hydrofluoric and other acids; containers for lipsticks, matches, soap, small medical instruments, razor blades, typewriter ribbons, and ointments; bottle caps; ink wells; bottles for water paints.

Office equipment—Inkwells, pencil sharpeners, fountain pen parts, containers for leads and typewriter ribbons, typewriter spools.

Structural parts for machines and meters—Parts for water meters, such as cases and worm wheels, disk counters, screen liners, hands, other machine parts.

Automotive industry—Switch buttons, rosettes, and other body equipment.

Fashion articles—Buttons, buckles, other notions.

Combs—All kinds of combs and barrettes.

Photography and optics—Film spools and cores, developing tanks, frames for magnifying and eye glasses, eye glass cases, plate or film holders, view finders, optical instruments.

Leather goods industry—Handles for bags.

Organic peroxides

(*Continued from page 136*) the thermal decomposition of *t*-butyl hydroperoxide and di-*t*-butyl peroxide which in future investigations may possibly be found related to their catalytic activities. Experimental evidence obtained with other peroxides,[11] however, indicates a decomposition of the peroxide, motivated by heat and other factors, and the appearance of free radicals. These radicals then activate molecules of monomer which in turn react with others until a polymer chain is produced. In the case of substituted benzoyl peroxides, residues of the original molecule have been found attached to the chain. By analogy, it is probable that the peroxides discussed in this paper react in much the same manner.

Polymerization reactions

The relative effectiveness of the various peroxides in bulk polymerizations vary according to the nature of the monomer and solvent (if one is used), their purity, the temperature of reaction, and the presence or absence of inhibiting materials. For example, in the bulk polymerization of distilled butyl methacrylate with various peroxides at 100° C. (Table VI), 1 percent by weight of 1-hydroxycyclohexyl hydroperoxide-1 and *t*-butyl perbenzoate seem most effective. However, the presence of 0.006 percent of hydroquinone (Table VII, page *218*) reduces the reaction rate of 1-hydroxycyclohexyl hydroperoxide-1 at the same concentration. In two-phase systems, however, as shown later, the presence of such materials as hydroquinone will actually accelerate the reaction.

With styrene alone, as well as the copolymers mentioned above, increasing the peroxide concentration increases reaction rate to maximum after which decreasing rates occur (Table IX, page 222). Similar effects were noted by Rainard[12] using butadiene with a potassium persulfate catalyst. With a styrene/isoprene copolymer, however, the decreasing rate is only slight.

Among the studies which have been reported of many of the factors affecting the reaction rate in emulsion

[11] "Addition polymerization catalyzed by substituted acyl peroxides," by Charles C. Price, Robert W. Kell and Edwin Krebs, J. Am. Chem. Soc. *64* 1103 (1942). "The polymerization of styrene in the presence of 3,4,5-tribromobenzoyl peroxide," by Charles C. Price and Bryce E. Tate, ibid. *65*, 517 (1943). "Reactions of atoms and free radicals in solution, IV. Decomposition of acetyl peroxide in aliphatic acids—a new synthesis of succinic acid and its substitution derivatives," by M. S. Kharasch and Matthew T. Gladstone, ibid. *65*, 15 (1943). "Radical chain processes in vinyl and diene reactions," by Hugh S. Taylor and Arthur V. Tobolsky, ibid. *67*, 2063 (1945). "The kinetics of decomposition of benzoyl peroxide in solvents," by Kenzie Nozaki and Paul D. Bartlett, ibid. *68*, 1686 (1946).

[12] Rainard, India Rubber World *114*, 67 (1946).

Table VI.—Effect of Some Peroxides on the Reaction Rate of Distilled Butyl Methacrylate at 100° C. (1 Percent Peroxide by Weight)

Peroxide	*Gel time*
	min.
di-*t*-Butyl peroxide	75
t-Butyl hydroperoxide (60%)	>60
di-*t*-Butyl diperphthalate	55
1-Hydroxycyclohexyl hydroperoxide-1	34
t-Butyl perbenzoate	28

Table VII.—Effect of Concentration of 1-Hydroxycyclohexyl Hydroperoxide-1 on the Reaction Rate at 100° C. of Butyl Methacrylate Inhibited with 0.006 Percent Hydroquinone

Concentration	*Gel time*
%	*min.*
0.1	>110
0.25	>110
0.50	100
1.00	58
2.00	45

polymerization, one of the most interesting has been a recent publication by Bacon.[13] He found that polymerization of acrylonitrile with potassium persulfate catalyst is accelerated in the presence of certain oxidizable metallic salts and organic compounds, as sodium sulfate, sodium thiosulfate, thioglycollic acid, pyrogallol, etc. These he terms "reduction activators." In 1942 it was discovered in this laboratory by Perry that hydroquinone and related compounds behave in the same manner with these peroxides in styrene emulsion systems, as was later reported by Bacon. It was found that in the presence of 0.1 percent hydroquinone and 1 percent *t*-butyl hydroperoxide the reaction rate of styrene was increased almost four times. Further, contrary to Bacon's observation with acrylonitrile, 0.1 percent *p*-benzoquinone in the same formulation increased the rate 4.25 times. Similar accelerations were later observed with the peroxides described here in styrene/isoprene systems, using such activators as quinone, potassium ferricyanide, potassium ferrocyanide, etc. Such peroxide/activator combinations are being used commercially today to accelerate the reaction rates of emulsion polymerization systems, enabling production capacities to be increased considerably. However, the greater activity of these novel peroxides over hitherto generally used catalysts, even without the use of activators, makes their use desirable, and with the proper regard for such additional factors as emulsion concentration, kind and amount of soap or stabilizers used, and pH, complete polymerization of most monomers becomes a matter of a few hours rather than days.

In the bulk polymerization of other monomers, as styrene, isoprene, butadiene, acrylonitrile and their copolymers, *t*-butyl hydroperoxide and *t*-butyl perbenzoate are found to be most effective catalysts. The physical properties of such polymers with regard to molecular weight, degree of cross-linking, solubility, etc., vary considerably, depending upon whether a *t*-alkyl hydroperoxide, di-*t*-alkyl peroxide, or *t*-alkyl perester is used.

Two-phase polymerizations are decidedly more complex than bulk reactions, each component of the emulsion playing an active role in the rate efficiency of the system. However, observations made with styrene copolymerized with isoprene and myrcene indicate that rapid conversion of these monomers may be made with, for example, *t*-butyl hydroperoxide or *t*-butyl perben-

[13] Bacon, Trans. Faraday Soc. 42, 140 (1946).

Table VIII.—Effect of 0.5 Percent Concentrations of Various Peroxides on Yields for the Emulsion Polymerization of Styrene Copolymers at 80° C. (Rosin Soap)

Peroxide	*Product yield after 24 hr.*	
	Styrene—1 mol Isoprene—4 mols	*Styrene—1 mol Isoprene—1 mol Myrcene—1 mol*
	%	%
t-Butyl hydroperoxide	92.3	64.6
t-Butyl perbenzoate	86.1	...
di-*t*-Butyl peroxide	55.7	...
1-Hydroxycyclohexyl hydroperoxide-1	35.0	...
Benzoyl peroxide	34.7	46.9
Ammonium persulfate		13.1

zoate, using relatively low concentrations. This is shown in Table VIII above.

Polymerization of modified resins

A third class of reaction in which the activity of these peroxides has been investigated is the polymerization of modified polyester resins. The curing of this type of resin generally involves the copolymerization of such monomers as styrene, cyclopentadiene, and the like, with an unsaturated polyester. These resins are becoming widely adopted in the laminating field because of their conversion at relatively low temperatures without loss of volatiles and with little pressure applied during the curing cycle.

Commercial polyester resins are converted from the liquid state in which they are received to a solid having functional properties through the application of heat and the use of a suitable catalyst. Two stages to the curing cycle are noted. The first is a conversion of the fluid resin to a soft gel-like structure, somewhat solvent-resistant and easily deformable. The second stage, occurring on the further application of heat, produces a highly solvent- and water-resistant, hard, cross-linked polymer, flexible or not depending upon the original composition.

The *t*-alkyl and di-*t*-alkyl peroxides and peresters have been found to be particularly efficient catalysts for these resins, producing rapid conversion at relatively low temperature. Improvement of physical properties, easier handling, and increased clarity in cast products accompany their use. Data in Table IV (page 136) show their effectiveness with some of the commercially available resins of this type. All observations were made at 50° C., with the exception of the Allymer CR-39 which was run at 100° C.; gel points were determined in terms of viscosity; the catalyst percentages indicated are based on the resin, and the gel time is expressed in minutes following the initial mixture of catalyst and resin.

Variations in the reproducibility of these figures were found to occur, depending upon the age of the resin and the condition of storage before using. The samples from which these data were derived varied in age from one to two months and were maintained at −20° F. between experiments. In addition to those resins listed,

these peroxides have also been found suitable for use with Marco resin series MR, Plaskon 911, Paraplex resins, Bakelite BRS and XRS series resins, Thiokol liquid polymers, Shell di-allyl phthalate, Monsanto Thalid resin, and others.

An interesting recent development in the curing of polyester resins has been the use of a secondary agent corresponding to the reduction activator mentioned previously in connection with two-phase polymerization systems. Several of these are now supplied with certain of the commercial resins. Their action is apparently one of acceleration of the decomposition of the peroxide, thereby increasing the reaction rate. Inorganic and organic oxidizable compounds of the type mentioned previously will function in this manner. One such promoter or adjuvant is Accelerator 1000 which exhibits a remarkable accelerating effect upon the cures obtained with the aforementioned peroxides.

Data in Table V (page 136) show acceleration of gel time for various resins with increasing percentages of Accelerator 1000, based on the resin, in the presence of 1 percent of each peroxide. It will be noted that, with the exception of 1-hydroxycyclohexyl hydroperoxide-1, greatly increased reaction rates are observed. With Vibrin 103, however, using this peroxide an increase is observed. In practice, the Accelerator 1000 should in *all cases be mixed with the resin* prior to adding the catalyst, for when mixed directly with the peroxide, decomposition under some conditions has been found to be so rapid as to constitute a possible hazard to the operator.

Comparing Tables IV and V, the possibilities of such an accelerator system are readily apparent. One can obtain almost any desired cure characteristics by suitably varying the catalyst concentration, the relationship of catalyst to accelerator and the temperature, remembering that the cure time is a direct function of these factors. Moreover, the use of the accelerator, by reducing the amount of peroxide required, is an effective means of reducing catalyst costs.

Table IX.—Effect of Various Concentrations of *t*-Butyl Hydroperoxide (60 Percent) on Yields for the Emulsion Polymerization of Styrene[a] and Copolymers[b]

Peroxide concentration	*Styrene*		*Styrene—1 mol Isoprene—4 mols*		*Styrene—1 mol Isoprene—1 mol Myrcene—1 mol*	
	Yield	*Rate*	*Yield*	*Rate*	*Yield*	*Rate*
%	%	%/hr.	%	%/hr.	%	%/hr.
0.1	...	...	80.1	3.34	60.6	2.52
0.25	...	...	91.6	3.82	63.4	2.64
0.3	23.6	1.12	...	...	...	...
0.5	55.0	2.62	92.2	3.84	64.6	2.69
0.7	73.7	3.51	...	...	...	...
0.75	...	...	92.7	3.86	...	...
1.0	100.0	4.76	92.2	3.84	65.2	2.72
1.3	97.2	4.62	...	...	...	...
1.5	...	...	...	...	51.4	2.14
1.6	67.0	3.19	...	...	...	...

[a] Stearate soap emulsifier, polymerized at 75° C. for 21 hours.
[b] Rosin soap emulsifier, polymerized at 80° C. for 24 hours.

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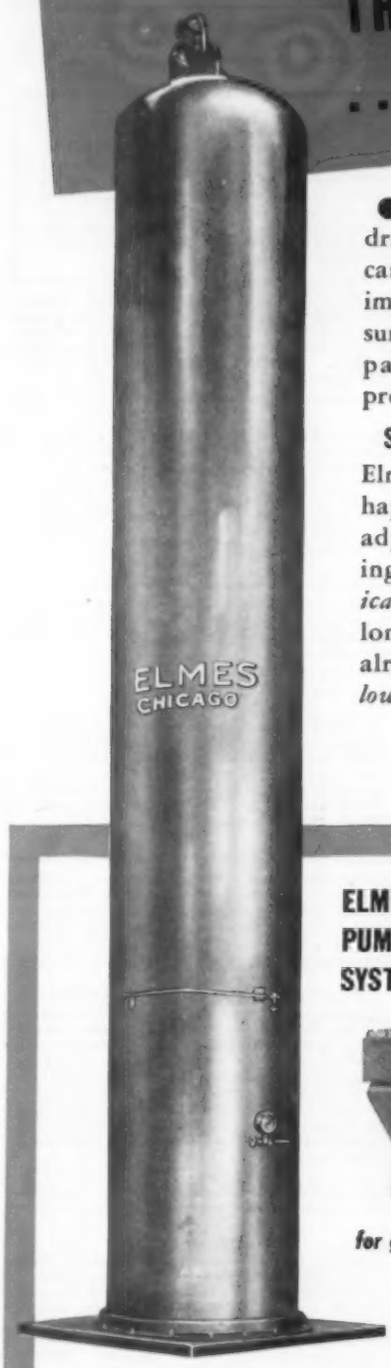

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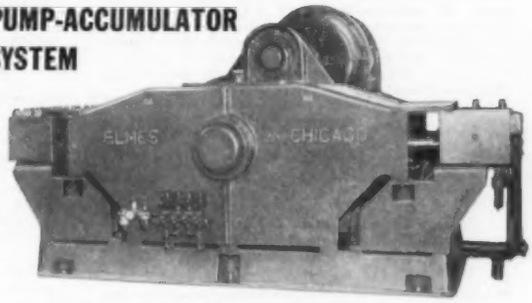

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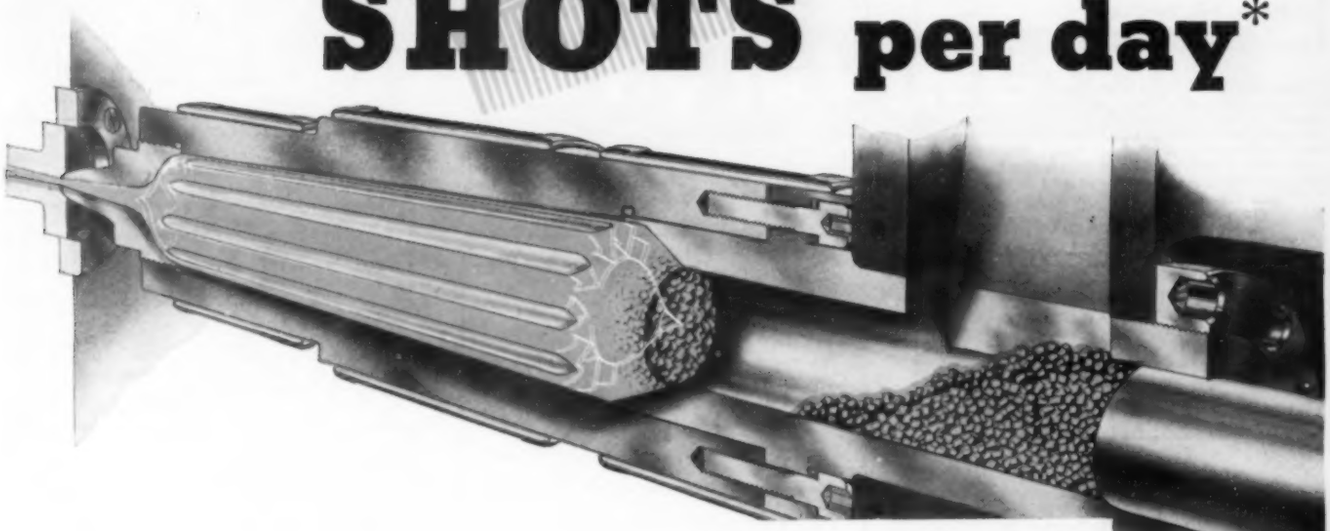

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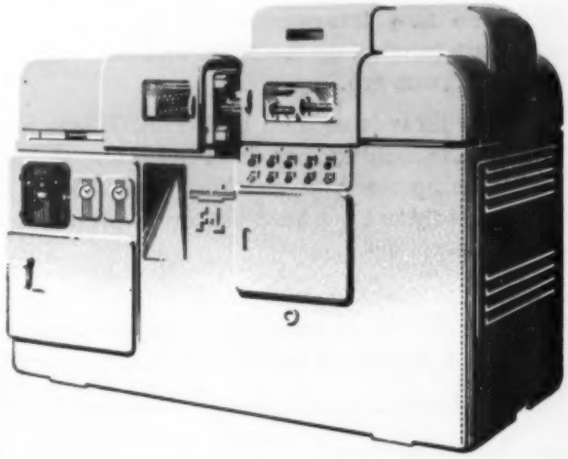

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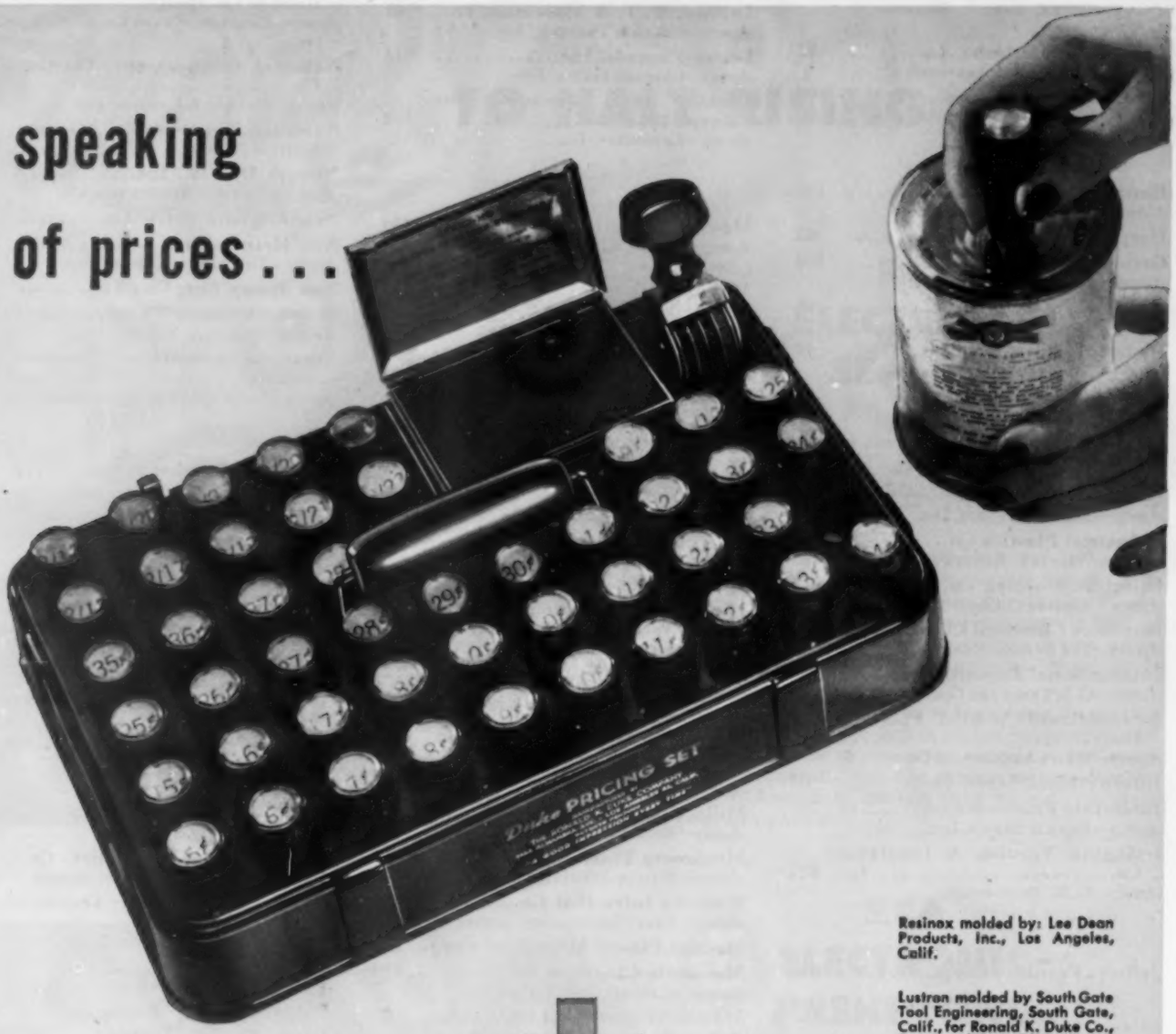
NOVEMBER 1947

(Please turn to page 230)

speaking of prices . . .



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(*Please turn to page 232*)

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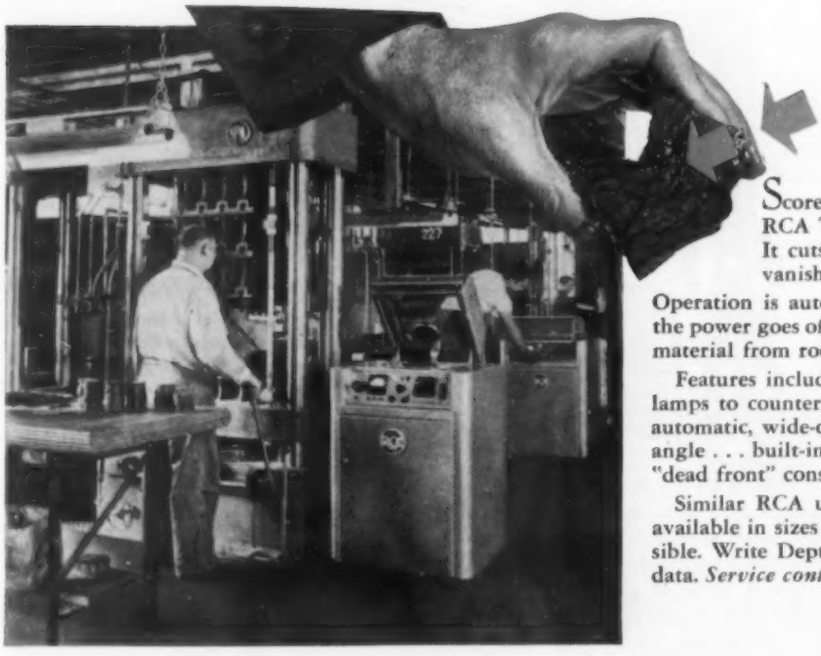
This RCA Universal Electronic Sealer (left) eliminates the need for solvents, cements, sewing machines, and heat-conduction methods—makes any shape of seal without the need of expensive dies. A brass, copper, or steel strip—bent to the shape desired—serves as the die material. "Dies" can be easily made and interchanged at will.

Other RCA bar sealers and generators are available for making intricate seams from a fraction of an inch to six feet in one operation. RCA installations include one- to ten-station setups . . . and equipment that, in automatic sequence, can make as many as seven different seams in one article. Immediate delivery now possible on many items. *Service contract optional.*



RCA ELECTRONIC PREHEATING

Scores of plastic molders are slashing costs with this RCA Type 2B (2-kw) Electronic Power Generator (left). It cuts molding time in half and reduces rejects to the vanishing point.

Operation is automatic. At the end of a predetermined time-cycle the power goes off, the protective cage pops open. Heats 24 ounces of material from room temperature to 270 F in 60 seconds.

Features include: *automatic* tuning and timing . . . infrared heat lamps to counteract surface cooling and prevent condensation . . . automatic, wide-opening cage for easy access to preforms from any angle . . . built-in voltage stabilizer for long tube life . . . approved "dead front" construction, key locks, and safety interlocks on doors.

Similar RCA units, built specially for the plastics industry, are available in sizes up to 100 kilowatts. Immediate delivery now possible. Write Dept. 55-K for complete specifications and application data. *Service contract optional.*

INDUSTRIAL ELECTRONICS

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

IN CASE YOU HAVE A QUESTION OR TWO

Q. Is your business devoted exclusively to Custom Injection Moulding?
A. Entirely. We neither design, mould nor merchandise a single item of our own. You get the full benefit of our expert engineers, designers, die makers and moulders.

Q. Do your facilities permit volume production?
A. Definitely, yes. Not only does Custom Injection Moulding lend itself particularly well to volume production, but our plant is the largest in the East devoted exclusively to Custom Injection Moulding.

Q. Do you maintain your own die shop?
A. We do. Our die shop, completely equipped, occupies an entire floor of our five story building with every employee a skilled die maker. We design and make our own dies and maintain them in perfect condition, which avoids costly delays in production.

Q. What is your machine capacity?
A. The capacity of our moulding machines ranges from the smallest piece up to one and one half pounds.

Q. Do you invite problems in product development?
A. We do. Our designers and engineers have helped to develop new products and to make important improvements in old ones for many of the nation's largest industries.

Q. Do you inspect products you mould before shipment to customers?
A. More than 150 thoroughly trained employees provide 100% inspection before packing to eliminate any need of costly reinspection by you.

At Worcester Moulded, as these answers indicate, and where facilities are vast and experience well-grounded, you'll find the answers to many of your problems in plastic parts and product development.

Custom Injection Moulding

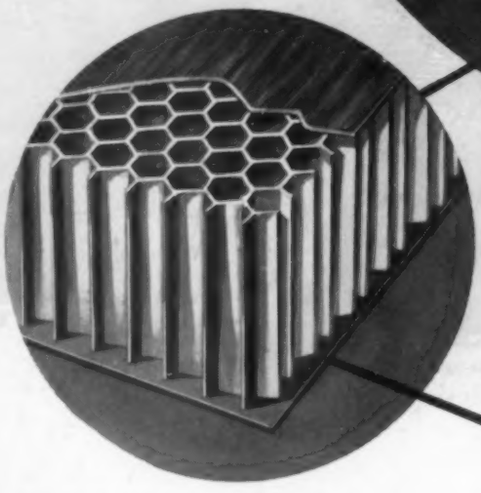
WORCESTER MOULDED PLASTICS CO.

14 HYGEIA STREET, WORCESTER 8, MASS.

17 East 42nd St., New York 17, N. Y.

130 West Chippewa St., Buffalo 2, N. Y.

"Honeycomb" plastic panel fabricated by U. S. Plywood Corporation.



HONEYCOMB PLASTIC

POUND FOR POUND

The Strongest Material Ever Made!

"DAISY," the elephant, planted all four feet on this 37-pound panel of "honeycomb" laminate structure impregnated with BAKELITE phenolic resin—and her full weight, tons of it, pressed down upon the unsupported span without detrimental effect. The panel was made from a cloth-base core surfaced with paper-base laminated phenolic sheet.

Thus "Daisy" confirmed, in her unscientific but convincing way, the exhaustive laboratory tests to which this material has been subjected. As a matter of fact, this "honeycomb" panel, 4′ x 3′ x 3¼″, offered "Daisy" a wide margin of safety. It could hold 25,000 pounds at midspan without failure.

Enormous strength is *inherent* in this new structural material. Designers and engineers in many industries are now studying its possibilities for weight-saving and product improvement. It was developed for aircraft uses—but it is ready for scores of other applications.

The structure can be built of paper, cloth, or glass cloth core, impregnated with BAKELITE phenolic resin, sandwiched between sheets of plywood, aluminum, plastic laminates, or other material. It is highly resistant to moisture, "weathering" and age. It may be had in a range of dimensions up to 5′ x 10′ panels with cores varying from ¼″ to 3″ or more in thickness. Certain constructions can be sawed like wood.

Address Department 6 for prompt handling of your inquiry.

TRADE—MARKS

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BAKELITE CORPORATION
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